CANADA

AT THE

GREAT INTERNATIONAL

FISHERIES EXHIBITION,

LONDON,

1883.

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CANADA

AT THE GREAT

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INTERNATIONAL FISHERIES EXHIBITION

LONDON, 1883.

LETTERS FROM EMINENT MEN

IN ENGLAND ON THE STANDING AND MANAGEMENT OF THE CANADIAN BRANCH OF THE GREAT INTERNATIONAL FISHERIES EXHIBITION, 1883.

ALSO

EXTRACTS FROM PAPERS READ,

AND DISCUSSIONS HAD, REFERRING TO CANADA, AT THE FISHERY CONFERENCES HELD IN LONDON DURING THE GREAT EXHIBITION CALLED BY THE AUTHORITY OF

HIS ROYAL HIGHNESS, THE PRINCE OF WALES.

1884
A. S. WOODBURN, PRINTER, OTTAWA.

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INTRODUCTION.

THE following letters, written by eminent men in England, are now published with the view that the opinions of persons of such high distinction and practical knowledge may be made known concerning the management of the Canadian Exhibit, and the important position occupied by the Dominion at the "Great International Fisheries Exhibition, London, 1883."

These Letters, and the Extracts and Discussions hereto attached, are not only of public importance in giving to the people of Canada information on the subjects referred to, but give evidence, also, of the satisfactory manner in which the special duties assigned to Mr. WILMOT, as Chairman of the Canadian Commission, were performed; in the general management of the Canadian display, which resulted so satisfactorily, and in the part taken by him at the Fishery Conferences held in connection with the Fishery Exhibition of 1883.

(COPY.)

Letter No. 1.

From His Excellency the Earl of Dufferin, K. P., G. C. B., G. C. M. G., late Governor-General of Canada.

BRISTOL HOTEL,
Burlington Gardens, 12th Sept., 1883.

MY DEAR WILMOT—

I cannot leave London without writing a line to congratulate you upon the triumphant part played by Canada in the Fisheries Exhibition.

The excellence of the arrangements, as well as the interest and splendour of the contents of the Canadian Department, have excited universal admiration.

A great number of people have spontaneously remarked to me that they considered it the best Court in the building.

I have been naturally very much pleased at such results, which must be equally satisfactory to yourself, who have taken such pains and trouble to secure them.

Believe me,

My Dear Mr. Wilmot,

Yours sincerely,

S. WILMOT, ESQ. DUFFERIN.

(COPY.)

Letter No. 2.

From Sir Alexander T. Galt, late High Commissioner for Canada, and Member of the Executive Committee of the Great International Fisheries Exhibition.

9 VICTORIA CHAMBERS,
London, S.W., 8th December, 1883.

MY DEAR WILMOT—

Upon your return to Canada after your most useful and arduous labours at the Fisheries Exhibition, I desire to express to you my sense of the great advantage which I am convinced Canada has derived not only from the Exhibit itself of our Fishery products and industries, but also from the admirable manner in which it was placed before the public through the earnest labours of yourself.

Having been a member of the Executive Committee of the Great International Fisheries Exhibition myself, I can speak with perfect confidence of the sense entertained by the entire Committee, of the extreme value of the Canadian Exhibit, and of the services of those who, with yourself as Chairman, had it in charge.

Having been absent from England during the greater part of the time the Exhibition was open, I am unable to speak from personal observation of the interest evinced by the public; but from all I hear, there was no country which stood higher than our own, either in the articles shown, or in the tasteful and attractive manner in which they were brought under notice by yourself.

I am convinced Canada will be well repaid for all the expense and labour devoted to this most interesting Exhibition.

Believe me,

Yours faithfully,

S. WILMOT, ESQ.,
43 Brompton Square.

A. T. GALT.

(COPY.)

Letter No. 3.

From James H. Crossman, Esq., Member of the Executive Committee of the Great International Fisheries Exhibition.

31 CARZON STREET, MAYFAIR,
London, 8th December, 1883.

DEAR MR. WILMOT—

I cannot allow you to leave this country for your Canadian home without expressing the high opinion I have held in regard to the magnificent display of everything connected with the Fisheries, and the natural productions of Canada, which you arranged and superintended in the great Fisheries Exhibition.

From all quarters I have heard but one opinion, that the Canadian department was both the most interesting and instructive of all in the Exhibition. Your constant presence and uniform courtesy and attention to all enquiries I had myself frequent opportunity of witnessing, and these were the qualities which were most required to ensure the success of the Exhibition to which Canada, as represented by you, so greatly contributed.

I need scarcely say that I shall always associate with my position as one of the Executive Committee, the very pleasant friendship I formed with you.

I hope you will receive on your arrival in Canada, some tangible mark of appreciation of the very valuable services you have rendered to the Dominion, during your residence in England.

Wishing you every success in the future,

I remain, dear Mr. Wilmot,

Ever yours sincerely,

S. WILMOT, ESQ., etc., etc.

JAMES H. CROSSMAN.

(COPY.)

Letter No. 4.

From Sir John Rose, Bart., G. C. M. G., etc.

BARTHOLOMEW LANE, E.C.,

December 12th, 1883.

MY DEAR MR. WILMOT—

It gives me very great pleasure to say that I think the arrangements at the Canadian Court were pre-eminently excellent—the management was everything that could be desired. This is not only my own opinion, but I have heard it expressed by every one who visited it.

The large number of medals which were awarded to Canada is sufficient proof of the excellence of the Exhibits and the admirable character of the management.

Believe me to be,

Yours very faithfully,

S. WILMOT, ESQ. JOHN ROSE.

(COPY.)

Letter No. 5.

From the Marquis of Hamilton, Member of the Executive Committee of the Great International Fisheries Exhibition.

MOTHECOMBE, IVY BRIDGE, DEVON,
December 11th, 1883.

DEAR MR. WILMOT—

In my opinion the Canadian Department of the Fisheries Exhibition compared most favourably with any of the other departments.

Your Court was very prettily designed and arranged, and moreover, the Exhibits were of a most interesting character. Yours was the only exhibit of live salmon hatched out from the ova, and these little fish attracted the attention of thousands of the visitors.

Your mode, also, of freezing was of the most perfect description, and you exhibited countless objects of the greatest interest and usefulness, which it is impossible for me here to describe.

The persons connected with the Canadian department were always civil and obliging. Accept these few words of acknowledgment which I send to you; I am sure I write them with great pleasure.

Yours very truly,

SAM'L WILMOT, ESQ., HAMILTON.

43 Brompton Square.

(COPY.)

Letter No. 6.

From Sir Francis Philip Cunliffe-Owen, K.C.M.G., C.B., C.I.E., Member of the Executive Committee of the Great International Fisheries Exhibition.

LONDON, December 1, 1883.

MY DEAR WILMOT—

Permit me to thank you for your kind letter accompanying the splendid fish which has been the pride of your Court and the wonder of the million.

You have worked nobly for your country, and it would be impossible to overrate the importance of the work you have performed.

It is not only by an admirable administration, and an intelligent arrangement, in both of which you have all along taken such a great share, with your colleagues, but your own presence, your energetic advocacy of the claims of the deep to the attention and cultivation of a civilized world, will long be remembered.

Your name, so well known and honoured in your part of the British Empire, will now become familiar to the world at large. You have nobly and with authority made battle for the rights of God's creature of the deep, as deserving even more atttention, from their miraculous and unseen resources than what we see, and upon whose development so much is done in order to promote the well-being of all classes.

I shall long remember all your lessons—in this I shall not be alone. Happily, are not your noble deeds and heroic actions recorded in the volumes in which your honoured name is so deservedly associated?

Thank you for the lessons of persevering ability and courageous attention to the great interests you have been called upon, for the good of mankind, to defend.

Accept this volume, prepared by my learned friend Mr. Maskell. You will find my portrait in it, to remind you of

Your sincere friend,

PHILIP CUNLIFFE-OWEN.

S. WILMOT, ESQ.

(COPY.)

Letter No. 7.

From Edward Birkbeck, Esq., M. P., Chairman of the Executive Committee of the Great International Fisheries Exhibition.

HORSTEAD HALL, NORWICH,
9th December, 1883.

DEAR MR. WILMOT—

I have written to Mr. Ed. Owen, our Secretary, to have an official letter written to you for me to sign, as Chairman.

I hope to see you next week and then shall be able to thank you for all your great kindness to myself, and for *your most* successful work at the Exhibition.

Believe me, yours sincerely,

EDWARD BIRKBECK.

(COPY.)

GREAT INTERNATIONAL FISHERIES EXHIBITION,
South Kensington, London, Dec. 11th, 1883.

DEAR SIR—

Previous to your returning to Canada I wish, on behalf of the Executive Committee, in addition to the official letter which was sent some time since to the High Commissioner, to testify their gratitude to your Government for the valuable co-operation we received from them at this Exhibition, both by the very valuable and exhaustive Exhibit which filled one of our large Courts, and also by authorising a Commission which, under you as Chairman, was so eminently fitted to carry out the work, and to assist the deliberations which formed so important an element in the Exhibition.

I cannot close this letter without congratulating you on the success of your pisciicultural apparatus, and on the fact

that you were able to hatch Salmon in the Exhibition, and keep great numbers of them alive throughout its term ; and also, I must express our admiration of the way in which the Canadian Freezers kept fish fresh for a period of eighteen months.

These and many others of the Canadian exhibits will certainly have lasting influence on the fish trade in this country.

I remain, dear sir,

Yours faithfully,

EDWARD BIRKBECK,

Chairman of the Executive Committee.

SAM'L WILMOT, ESQ.,

43 Brompton Square.

(COPY.)

Letter No. 8.

From the Secretary of State for the Dominion of Canada.

January 8th, 1884.

SIR—

I have the honor, by command of His Excellency the Governor-General in Council, to transmit to you herewith a copy of a certain correspondence submitted for the consideration of the Government by the Honourable the High Commissioner for Canada, in London, in which the services rendered by you on behalf of the Dominion, at the Great International Fisheries Exhibition lately held in London, are, by the desire of the President, His Royal Highness the Prince of Wales, specially acknowledged.

I have the honour to be, Sir,

Your obedient servant,

G. POWELL,

Under Secretary of State.

TO SAM'L WILMOT, ESQ.,

Late Chairman Executive Commissioners for Canada at the Great International Fisheries Exhibition.

PROPOSED
COLONIAL EXHIBITION,
—IN—
1886.

COLONIAL BANQUET AT THE EMPIRE CLUB,

At which the Exhibition of 1883, *and the forthcoming Colonial Exhibition of* 1886 *was Discussed.*

Mr. A. J. Adderly, Commissioner to the International Fisheries Exhibition for the Bahamas and Jamaica, entertained at dinner on Monday, the 12th of November, at the Empire Club, Sir Robert Herbert, K.C.B. (Under-Secretary of State for the Colonies), and his fellow Colonial Commissioners to the Exhibition ; Mr. Ridley (Newfoundland); Mr. Wilmot (Canada); Mr. Ramsay (New South Wales); and Dr. Day (India). The guests included Sir Saul Samuel, K. C.M.G., Sir Daniel Cooper, Bart., K.C.M.G., Sir Arthur Blyth, K.C.M.G., Sir W. C. Sargeaunt, K.C.M.G., Sir Rawson Rawson, K.C.M.G., C.B., Sir Philip Cunliffe-Owen, K.C.M.G., C.B., C.I.E., The Hon. Mr. Scanlan, Mr. Ebden (Colonial Office), Captain C. Mills, Mr. Davenport, Mr. T. Archer, Mr. R. Murray Smith, Mr. A. Hodgson, Dr. James, Mr. R. Davey, Mr. E. Cunliffe-Owen, Mr. A. J. R. Trendell, Major Sewell-Gana, Mr. Young (Colonial Institute) and Mr. Hales.

Mr. Adderly said: The health which I have now the distinguished honor of proposing is that of Her Majesty the Queen, long may she live to reign over her united empire. The toast was received with enthusiasm.

Mr. Adderly, in proposing the health of H.R.H the Prince of Wales, said that in 1878, at the close of the Paris Exhibition, the suggestion was originated of the formation of a Colonial Museum. In this H.R.H. the Prince of Wales at once interested himself, and displayed again that devotion which he has always shewn in matters conected with the colonies. Let us hope that the Colonial Museum, as suggested by His Royal Highness at the closing of the Fisheries Exhibition, which will be productive of such immense good to the colonies in developing their resources, may in due course be an accomplished fact.

The health of the Royal Family having being duly honored, Sir Daniel Cooper said: I have been asked to propose the next toast, which is, "The Fisheries Exhibition," and, standing as I do now in front of Sir Philip Cunliffe-Owen, I feel to be out of place in speaking on the subject of that Exhibition, and of the industries exemplified by it. At the same time, now that the extremely successful Exhibition of all appliances of fisheries has closed, and bearing in mind the learning we have derived from the various meetings, where the greatest authorities have placed on record the most important opinions, and remembering also the exceptional value of the literature which that Exhibition has produced, I am indeed honored in having the opportunity of proposing a toast connected with a subject of such vital interest. And in proposing the Fisheries Exhibition, I am asked to connect with it the name of a gentleman who has represented the Dominion of Canada. Mr. Samuel Wilmot, I think, may really be proud of the part that he has taken, and that his Colony has taken in the Exhibition. He has been spoken of most highly in connection with the Canadian Government who have taken so much trouble in so well representing their quarter of the world. Let me conclude with these few words: "The Fisheries Exhibition." (Cheers.)

Mr. Samuel Wilmot in response said: I am sure I feel in a state of trepidation in rising to make any remarks

upon the toast now proposed and so enthusiastically received. I feel this the more because I stand here as it were, an aboriginal Canadian who has come here to a country that he has never visited before, but I feel somewhat proud that I should have been called upon to speak so early in the evening upon this pleasant occasion, yet I am afraid that I cannot do justice to it. In the first place because of my incompetency to return thanks for so comprehensive a toast, and in the second place that it would be more meet and more in keeping that some other guest more distinguished than myself at this Colonial Banquet should have been asked to speak on so important a question. The success of this Fisheries Exhibition has been unapproached by any previous one of its kind. We have had many Exhibitions of the productions of the soil, but very few in connection with the products of the water. But so far as my knowledge and, so far as the knowledge of those here this evening goes, nothing of this kind has been equal to the success of the Exhibition that has just become a matter of history. With regard to the question of the immense destruction of fish, I am glad to see that this is gradually being alleviated, and that the thinking people of Great Britain are desirous of following the example of the Colonies in the matter of the protection of the fisheries. I am proud to say that the Dominion of Canada, which I represent at this great Exhibition, has always been foremost in the protection and propogation of fish. I think that it is time the Parliament of this country should legislate to a greater extent and prevent the unnecessary wholesale destruction of fish that is now taking place. England, I am sorry to say, is far behind any of its Colonies with respect to this subject. I consider the Fisheries Exhibition, which has just closed, was a great success in many ways, it had brought prominently before the world the immense benefits to be derived from the fisheries,—fish culture, and fish protection, and unless these subjects are more deeply thought of, a vast amount of food will be wholly lost. I am greatly pleased to think that the

Colony to which I belong, and of which I am proud to be a citizen, has not been behind hand in this Exhibition. Australia, several thousand miles away had come here and made a splendid exhibit, and the Bahamas, so well represented by our worthy host, Mr. Adderly; and other Colonies also had made good exhibits. Canada has come here and made, after its fashion, an ordinary exhibit. Taking all these things into consideration, I conclude, with all due respect to other exhibitors, that the Colonies had assisted materially towards the success of the International Fisheries Exhibition. If the collections from the Colonies and foreign countries were taken away I do not think the Exhibition could have held the high position it had occupied. There were some faults connected with this great undertaking, and there were a great many successes, but upon the whole I consider that the Exhibition carried with it much pleasure and much profit to all. In regard to the Awards, I may be allowed to draw attention to the fact that Great Britain has taken more than half of the whole. I do not contend that she was not entitled to these, but I am very strongly of opinion that the Colonies and foreign countries should have held a higher position than they occupied in this Exhibition, and that they had barely received the recognition that was due to them. I speak thus plainly, and, perhaps my remarks will not be endorsed by the other countries, but they are my own ideas of the matter. With reference to the proposed Colonial Exhibition, I believe if it were left in such competent and practical hands as those of Sir P. Cunliffe-Owen, who so thoroughly understands the position and the feelings of the Colonies, it would be a grand success. I feel sure that Canada will give her hearty support, and if all the Colonies of Great Britain were united together in this matter they could produce such an effect here that would even astonish the mother country and mark the Exhibition of 1886 as a great epoch in the history of the Empire. In conclusion I can heartily tender my warmest thanks for the hospitality

and kindness I have received from all quarters in connection with the Fisheries Exhibition, especially for the courtesy given to me this evening, and I feel proud that I have come into the home of my fathers and have had an opportunity of seeing this magnificent country. (Cheers.)

Mr. Hodgson, Premier of Cape Colony, said: "I beg to propose the health of Sir Robert Herbert, a learned and popular gentleman, and one who, from the time of his leaving Oxford, has rendered great and lasting services to Her Majesty's Colonies.

Sir Robert Herbert: I must return my best thanks for the very flattering remarks just made. "I have a toast to propose to you, one which will take care of itself without much recommendation, namely, "*Success to the Exhibition of* 1886, coupled with the name of Sir Philip Cunliffe-Owen." I have no doubt you have all heard or read the statement made by H.R.H. the Prince of Wales, in closing the Fisheries Exhibition, as to the future Exhibitions, and more especially with regard to the year 1886. The institution of a Colonial Museum has been a want much felt in this country, and the Exhibition of 1886 will doubtless be the means of causing the foundation stone of such a Museum to be laid. I feel sure that every one is desirous to help in every way in making the Exhibition a thorough success, it will not be a light matter, we shall all have to work, the Colonial Office will do its share, and a great deal must also be done by official persons generally. Well then, let us couple the name of Sir Philip Cunliffe-Owen with this toast, for we cannot forecast great Exhibition successes unless such enterprises are in the hands of Sir Philip. He stands absolutely alone as the person who has both knowledge and experience for conducting such great enterprises. No person is more sensible than myself of the great efficiency and courtesy which characterized Sir Philip's administration at Paris, Vienna and Philadelphia, and if he tells us that this Exhibition can be made a very great success, and

if he has a hand in it, you may rest assured that it *will* be a great success. He will now doubtless give us some explanation with reference to the future Exhibition.

Sir Philip Cunliffe-Owen, in rising to return thanks, said: It has always been Sir Robert Herbert's wish that everything should be done for the comfort and advancement of the Colonies, and that when their representatives came to the mother country they should feel that they were welcome. It is this spirit that has been inspired in me in the various conversations that I have had with him from time to time; and whatever success has been attained with respect to the past Exhibition is due as much to the kindly support of the Colonial Office as to our relations with the Colonial Governments and those gentlemen who have represented them. I have an assured conviction that we shall have one of the greatest successes that we can possibly have, in 1886, and I feel certain that it is only necessary for this country to learn what our brethern are doing in the Colonial Empire, for the reproach which has been brought forward in such a kind and gentle way to disappear. It is the ignorance on colonial subjects that exists in the mother country which has raised, unfortunately I fear, these reproaches. I therefore think that in this respect we shall have to clear away much of that which is not understood at the present moment. Many people in this country have hardly any knowledge of the geography of the Empire, and if they do not know geography, how are they to know the extent of our colonies, and the great and noble spirit which exists in them. It was in 1878 that for the first time in the history of exhibitions, H.R.H. the Prince of Wales determined that every Colonial Commissioner who had come to the Exhibition should be requested to further and advance the interest of the mother country upon the International Jury. I should have liked the jurors of the present Exhibition to have had a little of that spirit and good feeling which was predominant amongst the Colonial Commission-

ers in Paris in 1878; and they would then, probably, have been able to look with a much wider and broader view at that which they regarded during the past Exhibition. Now, gentlemen, with respect to this forthcoming Exhibition, we are perfectly aware that it dates from 1878. There was a spontaneous movement of the Colonial Commissioners—and a distinguished body they were—to bring before the Prince of Wales the desirability of the formation of a Museum, which would represent permanently the products of our great Colonial Empire. This deputation of the Colonial Commissioners was received by the Prince of Wales at the British Embassy, and His Royal Highness' response may be found in the Blue Books. It showed on the part of the Prince of Wales a determination that such a Museum should be founded, and this matter has been frequently referred to by His Royal Highness, in conversations which I have had the honor of having with him. I know it is a matter that he has had much at heart, and when His Royal Highness stated that these buildings should be kept for the next few years, it was with a view probably, above all, of carrying out this great Exhibition of the Colonial Empire, which will form a Museum representing the whole of the British Colonies. But for this Exhibition to take place, we need all the support and sympathy possible of our friends from the Colonies, in every part of the world; and I trust, that when the time comes, this country, which is ever ready to receive them, will rise up and say: "Let us have this great year for the Colonies! Let us all open our hearts and extend our sympathies to those who have maintained the honor of this great country throughout the length and breadth of the world!" May all of us here at this table live to see the results of that year; and let us all work harmoniously together and lay aside all petty grievances, and show from a Colonial point of view our fullest resolve to sympathize with the mother country. And I trust that any of you gentlemen, who may be shortly leaving this country, will take back with you, not only the hearty

desire of the Colonial Office, as expressed by Sir Robert Herbert, to co-operate in this great work, but also take back the knowledge that this is not a new idea of H.R.H. the Prince of Wales, but that the Prince of Wales has had this in his mind since 1878, and that he is determined that this shall be accomplished, and further, we in this country, and you, gentlemen, are also determined that this shall be accomplished. Before a very few months are passed, I hope that you will find documents arriving, following one after another, not to be thrown aside in the waste-paper basket, but to be acted upon with the knowledge of a firm intention to found a great Museum. With regard to the products of our Colonies, I should like in the first place to see all the framework of the glass cases and the furniture made with the various woods of the Colonies. How much could be done in the way of decoration in this country if we only made use of those woods which we have in our own empire! Then, there are marbles and stones which we practically know nothing about, and which could be used for pedestals, and various other products which would help to make the great Exhibition both attractive and instructive. May it please God that I may have some little life left in me to assist in this great work. I am sure that the Colonial Office, represented here by Sir Robert Herbert, will do its utmost in the matter, and I trust you, gentlemen, will not forget us when you go back to your respective countries. Let us make the year 1886 a red-letter year in the history of this great empire and show our sons and daughters that spirit of love of which we are all proud, and that the spirit of this empire comes from the great Colonies which are helping us, from all parts of the world, to that sense of friendship, eminence and security which we enjoy. (Cheers.)

Sir Rawson Rawson: There is only one other toast that I venture to propose after the most eloquent speech to which we have just listened, and which has filled and warmed our hearts, and that is the toast of our host, Mr. Adderly.

Mr. Adderly replied: Sir Rawson Rawson and gentlemen, I am deeply indebted to you, Sir Rawson, for the kind and flattering manner in which you have spoken of me. And I thank you, gentlemen, for having so kindly responded to the toast of my health. On so purely a personal matter, I feel naturally that the less I say the better. I am proud (indeed, I think I may call this the proudest moment of my life) in having brought together, around this table, so many distinguished gentlemen of the empire. I am delighted to have been able to do this, and can now only express the hope that united we may make the Exhibition of 1886 one of the grandest that has ever been held in England.

Extracts From and Discussions on Fishery Subjects

AT THE

INTERNATIONAL FISHERIES EXHIBITION

LONDON, 1883.

Conference on Thursday, June 21, 1883.

The Chair was taken at 11 o'clock by the MARQUIS OF EXETER, who, after referring to the Inaugural Address by Professor Huxley, and the Paper by H.R.H. the Duke of Edinburgh, said the Conference would to-day be invited to give their attention to the reading of a Paper on the Culture of Salmonidae and the Acclimatization of Fresh-water Fish by Sir James Ramsay Maitland Gibson, Bart.

After the paper was read a discussion of it was entered upon by the following gentlemen: Mr. Wilmot, Professor Huxley, Mr. Brady (Inspector of Irish Fisheries) Dr. Day (Commissioner from India) Mr. Willis Bund, Prof. Brown Goode (U. S. Commissioner) Mr. Oldham Chambers, Mr. Birkbeck, M. P., Sir James Maitland, The Marquis of Hamilton and the Marquis of Exeter.

DISCUSSION.

Mr. WILMOT (Commissioner for Canada) said he rose with pleasure to move a vote of thanks to Sir James Maitland for the very lucid and instructive paper he had read, for he felt satisfied that much benefit would be derived from it. He was a deep lover of the science of fish culture, believing it to be one of the means by which the population of the earth heareafter would derive much benefit in the way of food and wealth. It was well known that the waters of almost every country which had been largely inhabited had

become very scarce of fish, but this result was brought about by the greed and avarice of mankind almost entirely, not in consequence of the predatory habits of other fish which frequented the same waters. In any new country an abundance of fish was to be found in the rivers and waters, showing that the balance of nature was evidently correct; that though fish fed on fish they did not exterminate one another; but the moment man stepped in with his engines of destruction, the fish were reduced to such an extent that this great International Exhibition had been established for the purpose of devising means whereby this description of food could be increased. He regretted to find that, to some extent, there was a difference of opinion with regard to the means to be adopted to this end, but, for his part, he advocated the protection of fish in every possible way, as well as of assistance to those engaged in artificial production. In Canada this subject was of very great importance. It was now some years ago since artificial culture was introduced by himself, with the recognition of the Government, and now they stood second to no other country with regard to it. The number of Salmon they turned out annually was not exceeded by any other country in the world. During the last two years from thirty-five to forty millions of Salmonidae had been turned into the waters of Canada through the artificial process, and, though there were no doubt sceptics and others who were inimical to the science of fish culture, he thought that could only arise from ignorance of the benefits to be derived from it. At first sight it seemed extraordinary that fish could be produced by artificial means; but it was a most simple process when understood. Fish were so prolific, that man with a little ingenuity could produce from them far more than nature could herself, because it was a well know fact that large quantities of the eggs of the fish family were destroyed by other species. This was the ordained law; it was intended that fish should live on fish, because if all the eggs of the fish were permitted to hatch out, there would be no room in the waters for them. Consequently, nature had provided wisely that fish should live on one another, and this being the case, large numbers of ova must be consumed. Under artificial culture, however, where the eggs were protected from its enemies, a larger percentage could be brought to maturity than by the natural process. Hence, if it could be shown that 75 per cent. of the eggs could produce living fish, the system ought

to be encouraged by all intelligent people. Sir James Maitland had gone into the matter in a most lucid and instructive manner, and there was no doubt that when the Paper was disseminated it would do a vast amount of good. The only difficulty that he saw was, that it did not appear to go hand in hand with the ideas of some scientific gentlemen who maintained that protection was not necessary to some of our fish.* He contended, however, that if any intelligent country considered fish culture of service at all, it should also adopt every possible mode of protecting the fish. It would be no use for a pisciculturist to trouble himself to reproduce fish in great numbers if the intelligence and legislation of the country did not protect that which had been produced, and if every one were allowed to fish without any control. It seemed to him, therefore, that it behoved all who were interested in this matter to join in every possible measure to enhance the production of fish, either by natural or artificial means, and also to protect the fish afterwards. Nearly every civilized country possessed laws for the purpose of protecting fish; and when some gentlemen came forward and said that fish could not be exterminated, the consequence must be that all these protective laws were a mistake, and that every one should be allowed to kill and eat as he pleased. He maintained, on the other hand, that it was the duty of the legislature of every intelligent country to suppress intemperance of all kinds, not only in the matter of liquids, but in killing fish; and to pass judicious laws for the benefit of mankind. If any law were more judicious than another, it was that the waters should be protected from the inordinate destruction of man in order that the fish might be produced in larger numbers, both as a luxury for the rich, and for the benefit of the poor. He felt that he was treading on somewhat delicate ground in giving expres-

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* NOTE—Professor Huxley in his inaugural address says: I have ventured to advance upon this topic of the inexhaustibility of fisheries at some length, because it is of great importance, not only to the consumers, but to the fisherman. It is to current opinion on this subject that we owe fishery legislation. Now, every legislative restriction means the creation of a new offence. In this case of fishery it means that a simple man of the people, earning a scanty livelihood by hard toil, shall be liable to fine or imprisonment for doing that which he and his fathers before him have, up to that time, been free to do.

If the general interest clearly requires that this burden should be put upon the fisherman—well and good. But if it does not—if, indeed, there is any doubt about the matter, I think that the man who has made the unnecessary law deserves a heavier punishment than the man who breaks it.

sion to these sentiments; but as this was the first opportunity he had had, he felt it his duty to express publicly the strong conviction which he entertained on this subject.

Professor Huxley begged leave to second the vote of thanks which had been so well moved by his friend Mr. Wilmot. He could not recommend anyone who was endeavouring to acquaint himself with natural history to take up a more useful and valuable study than that of the manner in which Sir James Maitland had carried out his operations with regard to fish culture. He dwelt upon this point the more because, since the time—some forty years ago—when M Coste first popularized the notion of fish culture, the idea became prevalent that you only had to carry out artificial impregnation, or the collection of spat in the case of oysters, and the thing was done. He need not say what disappointment those who first experimented in the matter of oyster culture were destined to undergo; that was a matter recorded not only in the minds but the pockets of a large number of persons. The same considerations applied to all forms of fish culture, and unless those who undertook it were prepared to work at it with that happy combination of science and practice which was exemplified in the case of Sir James Maitland, disappointment would await their efforts, as it had those of many persons who had attempted the same process. For himself he did not take very rosy views of the value of protection pure and simple for sea fisheries, but perhaps *he was all the more inclined to attach special value to thoroughly well considered and scientific fish culture. He was inclined to think that it was in this direction we must look, and not to measures of inefficient protection, for the ultimate preservation of our fisheries.*

Professor G. Brown Goode (U. S. Commissioner) said he should be pleased to give a few figures illustrating what fish culture could do. Professor Baird (U.S. Commissioner) informed him that the Sacramento River, California, was, owing to the large number of canneries there, to a large extent depleted of its Salmon; but by the establishment of a hatchery there he had turned out something like sixty-seven millions of eggs or young fry of the California Salmon in the past eight or nine years, one-fourth of which were put into the Sacramento River, and it was now much more productive than ever before. On the Clacamass, in Oregon, a similar experiment was tried some years ago with a like re-

sult. These experiments had clearly shown that the Salmon industry of the Pacific Coast, which was now producing fish to the value of something like three million dollars a day, was thoroughly under the control of fish culture. He might also take the case of the Connecticut, in the last century, which was one of the most productive rivers ; but by the construction of a great dam, 60 miles above its mouth, the Salmon were cut off from the spawning ground, and for very nearly ninety years not a Salmon was seen. In 1866, or thereabouts, the Commissioners of Connecticut began to plant Salmon in this river, and some years afterwards they began to appear. In the first year 500 fine Salmon, of 15 lbs. to 20 lbs. each, were taken ; in the following year almost an equal number. Since that the Commissioners of the States have discontinued Salmon culture in that river, the supply has again fallen off, and the river might now be considered practically deprived of its Salmon again.

The subject of "Land locked Salmon" was then opened up by Mr. Chambers, when

Mr. Wilmot said there was a celebrated American showman who once came to England and took away an animal called Jumbo. The same gentleman in former years exhibited a certain animal at his museum in New York which he advertised as the "What is it ?" It seemed to him the same term might be applied to the land-locked Salmon. His impression was that there was no such thing in existence as land-locked Salmon, scientifically or naturally. It was the true *Salmo salar*, which had a different coat and a different shape, from the water it lived in, in the same way that the showman he referred to put a coat on the animal he exhibited.

Land-locked Salmon, which he called *Salmo salar*, was a fish which could be obtained by any pisciculturist at his pleasure; all he had to do was to hatch from the eggs of the *Salmo salar* a number of little fish, put them into a large body of water from whence they could not reach the sea, and if they found food congenial to their wants, they would grow and develop into a large fish, slightly changed in colour and scarcely perceptible in form. Such had been the experience in America and Canada. Lake Ontario was at one time filled with this fish. When he was a youth he had known thousands killed in one night, and the farmers caught them in such numbers as they entered the streams to deposit their

ova, that some of them got enough to buy their farms with. In the stream which ran within a few yards from where he was born and brought up he had killed hundreds and thousands of them on their migration up from *their* sea, (which was Lake Ontario,) into the smaller streams and rivers to deposit their ova, in the same way as the *Salmo salar* left the ocean and ascended rivers. For want of proper precaution, proper protection and good legislation, this Salmon had almost disappeared from Lake Ontario. At first there were no laws in the country, and consequently every man killed as he pleased, and as the poor creatures came up they were destroyed right and left. The Indians killed them, and the *white Indians* killed them still more. To prove that the *Salmo sebago* was the true *Salmo salar*, he might say that he had taken eggs of *Salmo salar*, impregnated them, hatched them, and taken them up into the rivers running into Lake Huron ; and to-day some of the true *Salmo salar* were found in Lake Huron, though smaller than were found along the coast. That was evidence to show that you might make land-locked Salmon in any water you choose where the fish could find congenial food, and where they could not get to the sea. It might be said, How could the Salmon in Lake Ontario be said to be land-locked when the St. Lawrence emptied that lake into the sea? Salmon were feeders in the sea and breeders in fresh water : they migrated annually to the rivers to reproduce. When they were abundant in the waters of the gulf, they passed up the St. Lawrence, entering every stream on either side up into Lake Ontario ; and were it not for the great barrier of Niagara Falls the Salmon would be found in the upper springs of Lake Superior. It was their instinct to go onward and onward until they found a suitable spot for spawning, and they would have passed into Lake Erie and Lake Superior, the same as Lake Ontario, were it not for the Falls ; the consequence was they entered into the smaller streams which fed the lake and went back into Lake Ontario instead of into the sea, where they had remained up to the present time, as the true sea Salmon, only acclimatized to fresh water. Any gentleman in England who was desirous of having land-locked Salmon, if he had a lake with a great depth in the middle and small streams running into it, into which the fish could go to breed, might produce land-locked Salmon from the eggs of the Salmon of the sea.

Mr. Birkbeck, M.P., on behalf of the Executive Committee, desired to thank Sir James Maitland for his excellent paper, and also to thank Mr. Wilmot for his remarks on the question of State aid to fisheries. He thought the advice he had given was most excellent, and only regretted that the House of Commons was not more largely represented. He could only hope that through the press the members of the Legislature would be able to read, mark, learn and inwardly digest what had passed, and would persuade the Government of the day to recognize the importance of giving assistance to our fisheries. He could not specify any one particular direction in which that aid should be given, but he went on the principle that inasmuch as State aid was given in foreign countries and in our own colonies, the same assistance ought to be given in England.

The Marquis of Hamilton had much pleasure in seconding the vote of thanks to the Chairman. He could not but think that the speeches which had been delivered that morning would have the most practical effect on all those interested in fisheries. He hoped the observations made by Mr. Wilmot with reference to State aid being given to the fisheries of this country, would be earnestly taken up by the public at large, and that before many months had elapsed they would take a practical form, and be brought forcibly under the notice of the Government.

CONFERENCE ON THURSDAY, JUNE 28, 1883.

DR. LYON PLAYFAIR in the Chair.

THE HERRING FISHERIES OF SCOTLAND.

BY R. W. DUFF, M. P.

DISCUSSION BY Dr. Lyon Playfair, Dr. Francis Day, Mr. Brady, (Inspector), Honorable Mr. McLelan, (Canada), Mr. Ronald Macdonald, (Aberdeen), Mr. Johnston, (Montrose), Mr. Wilmot, (Canada), Earl Ducie, Sir George Campbell, Mr. Duff, M. P., Mr. Bruce, M. P., and the Chairman.

Hon. Mr. MCLELAN (Canada), said that some of the fishing grounds on the great lakes in Canada, where the mode of fishing just referred to was adopted, were 400 or 500 miles long; and the reports coming from fishermen were, that unrestricted fishing diminished the number of fish even in these large lakes. Application had been made to him repeatedly to permit a smaller sized mesh of net to be used; but in consequence of the testimony which had come to him from all fishermen, he had refused to allow it. He considered it was a very important question whether sea fisheries were exhaustible or not; probably the most important question which could be discussed. Previous to coming to England, all the testimony he had received from the fishermen of Canada, both shore fishermen and sea fishermen, was, that on the great lakes, fisheries that had hitherto been very profitable were being exhausted from over-fishing, and from all he could hear from fishermen all round the coast, he had come to the conclusion that it was possible to exhaust the fisheries of the Dominion of Canada. Mr. Duff had told them that with regard to herrings they first had an open season, in which an average of 500,000 barrels of fish were taken every year; then for some seventeen years they had a close season, in which there was an average of 600,000 barrels, and then it

was made open again, and the average rose to 800,000 barrels. The inference from all this was, that it was better to have free fishing; but at the same time the honorable gentleman stated that the appliances for catching the herrings had been multiplied five-fold, and it occurred to him that if that were so, they ought to have had three million barrels of fish instead of 800,000 seeing the appliances had so largely increased. Then the question arose, with these multiplied appliances and the improved boats which had been referred to, was it not the fact that they went further to sea, and were sweeping over a larger area and not getting a proportionate return of fish? This was a point on which the testimony of practical men was needed. Science told them that fish produced so many eggs, and multiplied very fast; that one fish fed on another; and that the balance of nature ought to be preserved; that the little fish had larger fish to eat them; the larger fish had bigger ones to bite them, and so on *ad infinitum;* but they left out of sight a certain kind of fish which preyed on the others, but were not fit for food and therefore were not caught. To keep up the balance of nature they ought to fit out expeditions to destroy those fish which preyed on the edible fish; but if they left them to multiply and prey upon the others, and at the same time man went in with his five-fold machines to catch the herrings, the result would be, according to the testimony of Canada, that the fishing grounds would be gradually destroyed. It would simplify things on the other side of the Atlantic very much if it could be settled, by the testimony of fishermen and the investigations of science, that the sea fisheries were inexhaustible; then all they would have to do would be to improve their appliances for catching. Mr. Duff had referred to the want of harbors round the coast, and if he might be permitted to give the experience of a young country, he might say that they had felt the same want in Canada; but there the Government took hold of the matter, considering it of great public importance that the fisheries of the country should be protected, and that suitable harbors should be provided. Year by year large grants were made for the erection of suitable breakwaters and harbors of refuge, with the most beneficial results. He did not pretend to argue the advisability of this system in a country where it was the State policy for every industry to be left to its own resources; but in Canada, which might be considered more protective of native industries, that course had

been pursued, and fishermen had been protected not only by the providing of harbors, but by the distribution yearly of a quarter of a million of dollars in the encouragement of fisheries.

Mr. Wilmot (Canadian Commissioner), having heard the Canadian name mentioned conspicuously in regard to a particular description of net, wished to say a word upon it. He was not going to discuss the question of herring fisheries to any great extent, but merely to state, as he did on a former occasion, that if herrings were caught in such vast numbers as it was proposed to do by these machines it must more or less affect all other fish in-shore. The herring was the principal food of a large class of fish, and if they were destroyed to such an extent by these improved machines and all the ingenuity which man could bring to bear, not only would the herring be gradually exterminated, but it would very seriously affect the other fish which fed upon them. He regretted very much to find that the system pursued in Canada was now being taken hold of so readily by gentlemen from Scotland for the greater destruction of these poor innocent fish. These appliances were sent over to merely illustrate the mode by which fish were sometimes caught in Canada, and it was being taken hold of to exterminate, to a greater extent than was now done, the class of fish which in Canada they were desirous of protecting. The fresh-water herring of Canada was a different fish from the herring of the sea; it was a *salmonoid* very much superior to the herring of the sea, and at one time existed in vast abundance in the inland lakes of Canada. In some of those lakes there were scarcely any herrings left at all, and the consequence was there were no salmon, few salmon-trout, and not many of the species of fish which feed on those herrings. If this could be done in a short period of time in the great inland seas of Canada, the same results would follow here if these destructive engines were adopted, and no protection given to the fish. The food of the larger fish must not be destroyed if they were to be retained. Providence had made all things wisely; He caused the herring to multiply beyond almost any other fish, because it was fed upon more largely than any other description; consequently the herring must produce a greater number to keep up their kind, and if they went on inventing engines, and using every effort to destroy the smaller fish simply because he was small, the result would be, in the end, to exterminate the larger ones. However he would not speak at any length

on this subject, because he anticipated it would come up for discussion later. He rose to thank his friends who had thought proper to draw attention to the superior modes of fishing pursued in Canada, and to warn them not to use it very largely, for fear that if they did they would help to reduce the vast supplies of herrings in the sea, and as a consequence the larger and better description of fish also.

Mr. Wilmot asked leave to add, in explanation, that the salt-water herring fisheries of Canada were more extensive than the whole of those on the shores of Great Britain, and that whilst he spoke of the herrings of the fresh-water lakes Mr. McLelan had spoken of the herrings of the sea.

CONFERENCE ON 29th JUNE, 1883.

On Coarse Fish Culture by R. B. Marston.

Mr. Thomas Spreckley Chairman.

Discussion by Mr. J. C. Bloomfield, (Ireland), Mr. Mann, Mr. Wheeldon, Mr. Thos. Speckley, Mr. Geen, Mr. Senior, Mr. Crumplen, Mr. Seymour Haden, Mr. Wilmot, (Canada), Mr. Marston, Mr. Crossman, and Mr. C. E. Fryer.

Mr. Wilmot, Superintendent of Canadian Fisheries, said it afforded him great pleasure to indorse the sentiments contained in the Paper. If anything, it was as desirable to cultivate coarse fish as the higher orders, for, speaking from an experience of 16 or 18 years, the higher orders of fish could not exist without the lower orders. The Almighty, in His Providence, had thought proper to put into the same water fish of high order and of a low order, and it was frequently found that the high order lived on the low orders. If the latter were exterminated, the former would disappear. All the finest salmon rivers had in them certain species of fish of a very low order ; they entered the river at a different period to the salmon, to reproduce their species, and the young went down the rivers to the sea, and there in turn were fed upon by the salmon which frequented the same river. It was said by some gentlemen that you could not produce the lower orders of fish, but he main-

tained that you could produce a thousand of these to one of the higher orders, because they deposited their ova in the spring months when the weather was warm, whilst the higher orders deposited theirs in the autumn months when the weather was cold, and took from three to six or seven months to reproduce, whilst the lower orders were hatched in from three days to three weeks. Consequently nature had given the lower orders the greater preponderence. Throughout nature, as a rule, the lower orders supported the higher, and, therefore, it became the duty of man to carry out that which Providence had ordained. Carp was a poor man's fish altogether ; it could be produced in ponds and small preserves, and ought to be protected and cultivated almost above every other, whilst the salmon and trout were the rich man's fish, because those who sought them had to spend a large amount of money on the sport. With regard to bass it was a very bad voracious fish to introduce amongst others of a better quality, and he said this coming from a country where it was more famous than in any other part of the world. Where they found the black bass they never found the salmon or trout. There were lakes innumerable in Canada, where the bass, the pike and other fish of the same character abounded, but they never found in those lakes any of the higher orders of fish. There were also magnificent rivers, teeming originally with salmon and trout, and they never found black bass in them until lately, when, in consequence of man having killed all the salmon and trout, black bass had been introduced, and in consequence there was plenty of black bass there now. Black bass was a good game fish and a food fish, but they should be put into waters by themselves, or where there were plenty of inferior fish for them to feed upon, but not where they could interfere with better kinds. There was a lake in Canada which teemed with black bass, maskalongé, perch, sun-fish and others of the lower orders, and being a small lake the temperature in summer was 70° to 80°, and there the black bass abounded ; but the inhabitants fished it to such an extent that they exterminated the bass. A petition was sent in to the Legislature about it, and an order was passed that there should be no netting or spearing for three years. When that period expired there was an abundance. No one was permitted to spear in it or to net ; none but anglers fished it, and there was abundance for all. You never could destroy fish by angling, but in one year they could be destroyed by netting. Still it was

no use for an intelligent man to read such an instructive Paper as they had heard to-day, or for other people to discuss it, if men of science, holding the highest positions in the country, told them that it was useless to protect the fish, and that they could take care of themselves. He could only say, if such views were to prevail, the time would come when there would be scarcely any fish in Great Britain or any other part of the world.

CONFERENCE ON MONDAY, JULY 2, 1883.

ON THE FISHERIES OF CANADA.

By L. Z. Joncas.

Hon. A. W. McLelan (Minister of Marine and Fisheries of Canada) in the chair.

Discussion by Mr. R. M. Watson (Montreal) Mr. J. C. Parker, Mr. Herbert Hounsell, Prof. Brown Goode (U. S. Commissioner) Dr. Francis Day, (India) Sir P. C. Owen, K.C.M.G., C.B., C.I.E., Mr. Wilmot (Canada) and the Chairman, Hon. A. W. McLelan (Canada.)

Mr. Joncas said when Canada was first settled our rivers were celebrated for the number of salmon that were taken in them.

Afterwards, the rivers ceased to be so well stocked with fish in consequence of too many being taken at all seasons of the year, and of the want of laws and regulations for their preservation. But within the last few years, there has been a great change; good laws and judicious regulations limit the fishing to certain seasons of the year, and prescribe the kinds and number of fishing implements that may be used. Officers have been appointed to enforce the law; the coasts and rivers are well protected; from the eleven fish-breeding establishments which are under the control of the Government, millions of young salmon are distributed yearly in our rivers, and we have every cause to hope that in a few years our rivers will be replenished, and we shall be again able to procure and send to foreign markets, at moderate prices, this delicious fish which ranks so highly amongst the luxuries of the table. *This view is fully borne out by the*

official returns of our inspectors of fisheries, and overseers, whose returns for the year 1882 *give a most satisfactory account of the greatly increased number of salmon in the rivers and coast fisheries of the Dominion. Specially is this noticed in the rivers where young fry have been distributed from the hatcheries. I am happy to say that letters addressed to me from Canada, last week, state that the catch of salmon this season will be, according to all appearances, much superior again.*

Professor Brown Goode said that it seemed to him that the Canadian Department of Marine and Fisheries was one of the most valuable organizations in the world, and that their system of gathering statistics was one which other countries ought to study with a great deal of care. In the United States they had nothing of the kind. They had an inspection in 1880, but there was no permanent organization for gathering statistics. *Another matter which he looked upon with admiration was the great progress Canada had made in fish culture during the last twenty years, and more especially under the direction of Mr. Wilmot, who was one of the pioneers of fish culture in America.*

The fisheries of Canada and of the United States were so closely interwoven in all their interests that they really should be considered together, and compared very carefully with each other, and some calculations he had made convinced him that the annual production of the two countries amounted to more than all Europe, Great Britain excepted, namely, from 120 to 150 million dollars annually. It seemed to him that in Canada, as well as in the United States, the resources of the sea had hardly yet been appreciated. Here were millions of pounds of the most valuable food products annually wasted, and no doubt one of the results of this Exhibition would be that they would learn to make better use of them than they had hitherto done.

Sir Philip Cunliffe-Owen said it was now his pleasing duty, as a member of the Executive, to propose a cordial vote of thanks to the Hon. Mr. McLelan, the Minister of Fisheries of the Dominion, and he thought the very fact of his taking the Chair at the Conference, as a Minister of an important Government, such as that of Canada, was a proof of the importance which that Government attached to the protection and development of the fishing industries there. This gentleman, who had come over on the part of the

Dominion Government, and had shed lustre on the Exhibition by his presence and active assistance, was, he believed, the only Minister of Fisheries throughout the civilized world. They had heard from Professor Brown Goode that there was none in America, and he knew that in Europe such a Minister did not exist, and he wanted this fact to come home to them all. It was important that it should come home to all their foreign friends, and leave them to feel the great importance it was to the civilized world generally, to protect that which Providence had given them so bountifully.

Mr. Wilmot, in seconding the motion for a vote of thanks to the Chairman, said he felt sure the presence of the Minister of Marine and Fisheries had added much to the welfare of their great Exhibition, and when they learned that he was the only Minister of Fisheries present, he thought that fact said a great deal for the country which sent him here. Had he been in Canada, he would have spoken more fluently than he could hope to do, because it was stated that in Canada about 100 lbs. of fish were eaten by each inhabitant annually, whereas here, they only ate 30 lbs.; he had certainly not eaten as much fish in this country as he did at home, and therefore the intelligence which was supposed to arise from the eating of fish would not be so manifest with him. This Exhibition was fraught with a good deal of good or harm. Good if they took hold of the sentiments put forward by Sir Philip Cunliffe-Owen, but if of sentiments derogatory to fishing interests, which were put forward in what was to be considered one of the text-books of the world hereafter, then great injury would be the consequence. His friend and associate from Canada, Mr. Joncas, had read a most lucid and instructive Paper; and, without desiring to eulogize it too much, he must say that if like views were in the inaugural address, it would have been fully better, and superior to those which were read, because there was a ring about this which meant protection to the fisheries of the world, whilst in that which was read, there was a prevailing sentiment that no protection was wanted, and he contended it was very injurious to put forward the idea that protection was not required. What did they find in this Paper? That in Canada, a young country, fishermen found already that they had to go farther away to catch the fish. The fish came in near the shore to spawn, and went out into the deeper

waters again to feed, and when an article of food like fish came to the shores of any country to reproduce they should be protected in that act, and not slaughtered as they invariably were. Was it not agreed that they should protect salmon when they came into the rivers to breed? Laws were passed, saying that men should not kill salmon for a certain period when on the spawning grounds, and did not the same laws of nature hold good with regard to other fish? If any animal were destroyed in an advanced state of pregnancy, it was a mere matter of time to exterminate it, and if the herring or cod came from the deep waters to our shores to reproduce their species, should it not be the duty of those who conducted the affairs of the country, to say that man should not destroy the pregnant creature, because by refraining from doing so a much larger quantity would be produced hereafter. What possible harm could there be to the fishermen to do this? it was doing him good; he would reap more fruit from it, and, not only he, but posterity after him. It was, therefore, in his opinion, the duty of Legislatures to pass some such measures as would prevent people continually killing these fish. There were twelve months in the year, and if during those twelve months there was one when the cod came to deposit their eggs and another one when mackerel came to spawn, why should not man be restricted during those particular months, and allowed to catch fish during the other eleven. Why should he fish 365 days in the year? It was found that the principal cod, herring and mackerel fishing was within a certain distance of the shore, they were not caught so much in the greater depths of the ocean. Many people said the sea could not be exhausted, but that was a fallacy, because in every civilized country of the world they were using means to increase the number of fish, and it was evident that they found they were getting less and consequently were anxious that something should be done. Britain was one of the countries which did not pass laws for the protection of fish in the sea. All along the coast of Norway and Sweden fish were getting scarce, and within the three or four miles' limits where they used to catch cod in great abundance, they were almost gone. They had to go farther and farther, showing clearly that they had destroyed them on the nearer limits. Professor Goode, in his lecture the other day, intimated that it was unnecessary to pass laws for the preservation of fish in the sea, but now he said that in Canada the progress was very satisfactory because it

had judicious laws for the preservation of its fish. Within the last twenty-four hours he had received a letter from a very shrewd and clever fisherman of the Bay of Chaleur, in Canada, in which he said that (on account of the protection given and the immense number of young fry turned out into the rivers), on the 12th June, the day he wrote, they had caught more salmon than were caught last year altogether. He said :

Dear Sir,—I have been down here since the 1st, and am glad to say I have got more salmon already than the whole number we had last year, and every appearance of a very fine catch, and oh! such beauties, and even prettier fish than the old Restigouche salmon. So far they give an average of twenty-two pounds ; of course markets are down, Montreal and New York glutted ; we are now freezing the fish. My son wrote me from the Restigouche fishery on Saturday, telling me that he put 300 salmon in his freezer that day averaging 25½ pounds each, and says they are better than the 'big run' of 1879. Now, Mr. Wilmot, I am pleased at this, and I am sure you will be ; but I confess it is nothing more than I anticipated, notwithstanding the jeers and scoffing of such poor narrow-minded wretches, who, carried away by spite, envy and malice, have done all they could to bring our efforts into public contempt ; even parties from whom better would have been expected were almost convinced by these specious pleas, until the clear necessity and benefits of artificial breeding were shown as overcoming the natural losses of eggs and young fish from ice, freshets, etc. * * *

"I hope your Exhibition is a success, as I know you will try to make it. If you can, find time do drop me a line.

"Yours, etc.,

"John Mowat."

Some people said that the Fisheries were inexhaustible, now if we could get practical knowledge that that was so, he would not object to it, but they had only theoretical knowledge of it. They were told the other day of a peculiar case which would prove that the sea was inexhaustible of fish, but if a theory were built on a theory there ought to be some practical basis to commence with. If it were theoretical from beginning to end it could be of no value. Having read the passage from the opening or Inaugural Address

referring to the cod at the Islands of Lofoden, Mr. Wilmot said that was put forward to substantiate the theory that fish were so numerous that it was impossible to exhaust them, and therefore, it was unnecessary to have judicious laws to protect them.* He contended on the contrary that there was not a tittle of foundation to show, because codfish might be numerous there, that it was not necessary to protect them. There were 27,800,000 and odd square feet to the mile superficial measure. That would give 185,956,000 codfish, supposing them to be in 60 layers 180 feet in depth. It was said they came in all along the coast continuously for two months, as the coast could not be less than 50 miles, that would give 9,000,000,000 of codfish, and as they came in for two months or 60 days, multiplying that 60 it would be 540,000,000,000 of codfish within that area of 50 miles along the shore, and adding one-tenth for herring space (the food of the codfish) it would cover 64,566 superficial miles of ocean. When theories were commenced in that way it appeared to him to amount to an absurdity. It was wrong to put forward such data to any intelligent community; it was unfair to the community and unfair towards those who had laboured for so many years to protect fish, and unfair to all who had stood on that platform, most of whom accorded with him in his views that fish should be protected. If documents of this kind went forth it would do a vast amount of harm, and he hoped the intelligence of that audience and Great Britain would go with those who were anxious to get laws passed to protect fish universally, not select one kind of fish because it was comparatively easy to protect them, but all fishes should be

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* Prof. Huxley says: "At the great Cod-fishery of the Lofoden Islands, the fish approach the shore in the form of what the natives call "Cod-mountains"—vast shoals of densely-packed fish, 120 to 180 feet in vertical thickness. The Cod are so close together that Prof. Sars tells us "the fishermen who use lines can notice how the weight, before it reaches the bottom, is constantly knocking against the fish." And these shoals keep coming in one after another for two months, all along the coast.

A shoal of Codfish of this kind, a square mile in superficial extent, must contain at the very least 120,000,000 fish. This allows over four feet in length for each fish, and a yard between it and those above, below, and at the sides. But it as an exceptionally good season if the Lofoden fishermen take 30,000,000 Cod; and not more than 70,000,000 or 80,000,000 are taken by all the Norwegian fisheries put together, so that one fair shoal of all that approach the coast in the season must be enough to supply the whole of the Codfish taken by the Norwegian fisheries, and leave a balance of 40,000,000 or 50,000,000 over.—The principal food of adult Cod appears to be herring. If we allow only one herring to each Codfish per diem the Cod in a square mile of shoal will consume 840,000,000 herring in a week.

protected, because mankind needed them all. It had been a labour of love with him for many years to study the habits of fish, and he regretted that, with many persons at the present time, *there was too much theory and too much science* without practical knowledge at the bottom of it.

The motion was then put by Sir P. C. Owen, and carried unanimously.

The Chairman, Hon. A. W. McLelan, in responding, said he felt quite overcome by the flattering terms in which the resolution had been proposed, and the enthusiastic way in which the work which he and his government were doing in Canada had been spoken of. It was true that the Government of Canada felt a deep interest in the preservation of fisheries, because they knew how important it was to her people that those fisheries should be used, and not abused. Their object had been that what some scientific gentlemen there called the balance of nature should be preserved, or that it should not be too much broken. The balance of nature had been running for centuries before the fishermen came in, and the proper proportions of fish were all preserved ; the fishermen came in, and with their multiplied engines for destroying fish were likely to destroy the balance of nature, and so to destroy quantities of food fish, so important to the people of the Dominion and other countries, for they believed with proper care they should have large quantities for export. Sir Philip Owen said they should all live on fish, and certainly in going to the meat markets of England there was a great inducement for people to live on fish if they could. But if they would come over to Canada, and take a free farm—such as they were ready to give to millions of people —of 160 acres of as fertile land as ever rain or dew descended upon, they would have not only fish to live upon, but good beef, mutton and poultry, and all else they desired to make a variety on their table. The Government of Canada not only passed laws, but believed it was necessary to provide shelter and protection on the more exposed portions of the sea coast to protect the lives of the fishermen. They had heard from time to time how dangerous was this occupation, and that it showed the largest percentage of loss of life of any occupation in which man engaged. In Canada they built harbors and breakwaters to which the fishermen in exposed places could resort in case of sudden storm, and young as they were, and poor as they had been, they had expended

about six million dollars for that purpose. They had also been told that sometimes fishermen went out and toiled all day and night but caught nothing, but the Government had also endeavored to provide against that by laying down telegraph cables along the coast to all the stations, so that when the fish struck on any particular point they could telegraph to all the fishermen who at once could come there and load their vessels. Professor Goode had referred to the fact that a great many Nova Scotians went to the famous fishing-port of Gloucester and manned their vessels, and that was no doubt the case; they found that in the summer their own fishermen were employed off the coast, but in the winter season they went to the United States because they had a better class of fishing-vessels for winter service, and could go out to sea with more safety; they therefore encouraged the building of a better class of vessels in their own country, and for a number of years had devoted 150,000 dollars a year to this purpose, paying so much a ton for a better class of vessels, so that their own fishermen might be employed during the winter and not have to go to a foreign country. He had been referred to as a Canadian Minister to the mother country, and he must say it was a pleasure to him to be received in the kindly manner that he and his associates on the Executive Board had been received. He was proud of the phrase which he had used, coming to the "mother country." There was no name of which they were more proud in Canada than that they were sons of Great Britain; that they were connected with this great Empire, so glorious in her past, so great and mighty in her present, and which had before her such a grand and magnificent future. They were proud to be connected with Great Britain, but they were proud also that they were no weak, helpless, dependent members of the Empire; that they were no encumbering members, for they felt that they in Canada were bounding forward in prosperity; they were going forward with a great tide of healthful blood flowing in their veins and beating in their hearts, hearts strong for the present, and big with hope for the future, and hearts which he trusted would long be true and loyal like British hearts when waked by the strains of "God save the Queen."

CONFERENCE ON TUESDAY, JULY 3, 1883.

THE MARQUIS OF HAMILTON in the Chair.

ON FISH DISEASES.

BY PROF. HUXLEY.

DISCUSSION by Mr. Follett, Prof. Huxley, Dr. Spencer Cobbold, Mr. Marber, Mr. Mackenzie, Mr. Siggins, Mr. Wilmot (Canada), Marquis of Exeter, Sir James Maitland, Prof. Honeyman, Mr. Fell Woods and the Marquis of Hamilton.

Mr. WILMOT said it afforded him much pleasure to be able to say a word or two on this very destructive agency, which was causing so much injury to the rivers of Great Britain, *Saprolegnia ferax*. It had been his misfortune to have differed with the learned Professor on the protection of the fisheries of the world; but on this occasion he was glad to offer him his best thanks for the interesting lecture he had given on this most insidious disease. He felt that in this case science was doing most useful work, and hoped that by further investigation a cure for this terrible disease would be arrived at. He believed, too, that it was only within a few years past that it had prevailed very largely in the rivers of Britain; he had been engaged in connection with fisheries for many years past, and sixteen years ago this disease was known within the small confines of the house where he was engaged in fish breeding, and his opinion, though he might be wrong, was that it was largely brought about by a pollution of the reduced flow of water in the streams, occasioned by the country being cleared of its forests and being over-heated by the sun's rays. This tended to germinate in the river immense quantities of infinitessimal vegetable spores, which, floating down, came in contact with the diseased fish, or fish which had been injured by the fishermen and others and produced *Saprolegnia*. In catching these fish in the stream, in the Province of Ontario, for the purpose of cultivation, it was found that many fish died

from the following cause: The fish had to be caught by hand in the stream, and strict instructions were given to the men always to catch them by the tail, because, in catching them by the head the gills were always injured, and that necessarily proved fatal. The men went into the river, waded up the stream, and caught the fish on their beds at night, and at other times, in the day time, when they had their heads underneath the logs which abounded in the stream. The fishermen then carried the fish some distance to the house; but they invariably found, after the first or second year, that many of these fish died, the reason being that round the tail where the men had caught the fish, sometimes bruises were made, and there this peculiar sort of fungoid growth appeared, and spread until the fish died. This was in 1867 or 1868, before he knew anything of *Saprolegnia*. In order to avoid this they introduced woolen or cotton gloves which had been used ever since, because they were found less likely to injure the fish. Sometimes, also, a man from hurrying or carelessness, would grab a fish across the back, leaving finger-nail marks upon it, and in a few days after they invariably found three or four stripes of fungoid growth appearing, and the fish invariably died. He, therefore, came to the conclusion that this fungoid growth was the result of infinitessimal spores coming down the stream, which produced this growth on the bruised portions of the fish, and the fish could not shake it off because they were generally in a prostrate and lean condition after spawning. This disease did not prevail generally in the United States, or in any other country in its natural state. Nearly all the rivers and streams, when the country was first inhabited, were pure and limpid, the waters were cold, and these immense number of spores did not then vegetate in the rivers; but as countries became cleared, and the volume of water was reduced by absorption and evaporation, and by the superheating of it by the sun's rays, more of these spores were produced, and when the fish were hurt, as they now were by fishermen catching them, and by passing through nets, and in getting injured as they came up into the rivers, they were more liable to be attacked, and so the disease was produced. He believed there was no possibility of overcoming it until they could somehow change the waters up which the fish migrated. Another mode would be by improving the protection of those fish which could escape up the river. He might

dilate on this subject, and would assure the Conference that unless some greater efforts were made to protect the fish in every possible way, they must expect them to be decimated in the end. He believed the practical remedy was to preserve fish by judicious laws, and prevent men destroying them at improper times, and also to prevent the polluted matter being allowed to flow into the stream.

CONFERENCE ON TUESDAY, JULY 17, 1883.

ON FISH AS FOOD.

By Sir Henry Thompson.

Sir Philip Cunliffe-Owen, K.C.M.G., C.B., C.I.E., in the Chair.

Discussion by Dr. Cobbold, Mr. Kenneth Cornish, Mr. Wilmot, (Canada) ; Prof. Goode, (U. S. Commissioner) ; Mr. Alfred Jardine, Sir Henry Thompson, and the Chairman, Sir Cunliffe-Owen.

Mr. Wilmot (Canadian Commissioner), said he had listened with much attention to Dr. Cobbold's remarks, but he was of opinion that the parasites referred to were in the fish at a time when they might be called foul or unclean, or unfit for human food—at any rate they predominated in them during that period. If they were only to consider that there was a time for eating fish, as there was for any other food, when it was in a proper condition they need not be alarmed at these parasites, but unfortunately large quantities of fish were caught in an unfit condition, their abdomens distended with the ova. Was it not a fact that they had laws forbidding the killing of salmon in that state ; and no farmer would be allowed to bring into the market a beast that was far advanced in pregnancy. Fish were out of sight, and therefore to a certain extent, out of mind, but they laboured under the same difficulties as the domestic animals, and it was the duty of man to protect them during the breeding season.

CONFERENCE ON TUESDAY, JULY 17, 1883.

ON SALMON AND SALMON FISHERIES.

By David Milne Home, F. R. S. E.

The Lord Lovat in the Chair.

Discussion by Prof. Brown Goode, (U. S. Commissioner); Mr. Wilmot, (Canada); Mr. C. E. Fryer, (Home Office); Mr. Jas. H. Crossman; Mr. Bloomfield; Mr. Milne Home, M.P., and the Chairman, Lord Lovat.

Professor Brown Goode, (United States Commissioner), said he had listened with very great interest to the Paper which Mr. Milne Home had presented, and he rose to say a few words, which were perhaps invited by the closing sentences of the address, concerning what America had been doing in the way of salmon culture. He was led to do that by the fact that certain documents had been distributed from Canada, which had rather a tendency to depreciate what had been done in fish culture, not only in Europe, but in the United States. It had been said that fish culture was only an experiment, and had not been attended with commercial success: he, however, wished to say that it was in no sense an experiment, but that in the United States and in Canada it had been a decided success, and was so recognized by every one. It was not likely that the American Congress, or the Canadian Government, would for a period of ten or twelve years keep on making annual appropriations for fish culture if they were not satisfied that it was not only a success from a scientific stand-point, but a success from a commercial point of view. In the United States the general Government had appropriated considerably more than a million dollars, and the individual States a sum almost as great. Up to 1798 large numbers of salmon were caught in the Connecticut river, but until 1870 the fish disappeared entirely from the river, and until about 1875 no salmon whatever were seen in the river. In 1875, however, the salmon began to appear, and this was the direct result of the planting of a large number of young fry in that river three or four years previously.

Then again in the case of Sacramento River of California, where about two million young fish were planted yearly, the catch had increased in five years from five million pounds to fifteen million pounds, and in 1881 there were more fish than could be utilized by all the canning establishments on the river. He would not proceed with the multiplication of examples, but would refer to the fact that the fish in the Detroit River, where the United States and Canada had established hatcheries, had been increased, and the supply immensely improved. The shad was taken in twenty or thirty great rivers on the Atlantic coast, and was for several months of the year a most important food supply. About twenty years ago it was found that the supply of shad was beginning to decrease, and Fish Commissioners were organized with the special object of increasing the supply. He had seen shad which four or five years before were selling at 4*s.* or 5*s.* a pair, and were therefore beyond the reach of poor people, become so cheap and common that they could be bought for a shilling a pair, which was entirely the result of fish culture. Professor Baird had been the leading spirit of fish culture in America. He was asked recently if Professor Baird was not an enthusiast, and he replied that he was not, but a man possessing the widest general and philosophical knowledge of natural laws, whose sound judgment and experience had enabled him to take up the work of fish culture and carry it on on an immense scale in the United States. People were sometimes dissatisfied because fish were sometimes planted in streams and nothing was heard of them afterwards; but it was the theory of their Commission and of their Government that it was a proper thing to make experiments, and if they happened to be unsuccessful there was so much ground eliminated over which it was unnecessary to go again. *He thought the experiments which had been successful ought to be allowed to balance those which had not.* Experiments in fish culture in Europe, especially in Holland and Germany, had yielded exceedingly promising results. Mr. Whitcher had singled out two rivers in Canada, out of many, for the purpose of supporting his view that fish culture had not been a success, and had stated that although a large quantity of salmon was taken out of certain waters in 1871 there was none in 1881. Mr. Whitcher, as Commissioner of Canada, was charged with the preparation of a report to the Canadian Government upon the state of the fisheries. The report for 1882, which surely ought to have been

within Mr. Whitcher's access when he published the circular, stated that the salmon fisheries nearly all over Canada, had been much better in 1882 than within the preceding ten years; and other testimony showed that there had been a magnificent improvement. He knew that Mr. Wilmot, who had been criticised somewhat in the circular, would feel some diffidence in speaking on the point, but he thought he owed it to him to point out that the official documents proved that fish culture had not been in any sense a failure, but a decided success.

Mr. Wilmot, (Canadian Commissioner), said it was with considerable diffidence that he rose to make any remarks upon that important question. He had been much delighted by the very instructive Paper on salmon fisheries, a subject which of course required a great deal of time to enter into fully. Mr. Milne Home, on the opening of the Exhibition, visited the Canadian Court, and he felt sure, from the way in which he expressed his views, that he was extremely delighted with the *modus operandi* of fish culture in Canada. A few days ago Mr. Home called upon him and stated that he was somewhat astonished to see from a circular he had received from one of the officials in Canada that fish culture had been seriously found fault with, at the same time stating that as he was about to read a Paper on salmon fisheries, it would be his duty to refer to the subject, as it was of great importance, and affected very seriously the interests of the salmon fisheries throughout the world. He was pleased that Mr. Home had only briefly done so, as it gave him the opportunity of going into the matter very fully; but as it appeared that many other persons had received circulars of the same kind, he felt, on behalf of that great and important portion of the British Empire, Canada, whose government had thought proper to expend large sums of money in advancing the interests of salmon culture, he ought to say a few words on the point. Salmon culture was initiated in the Dominion by himself as a private individual, and he was pleased to say that from the day it was initiated it had gone on progressing and prospering. The Government of Canada at first thought very little of it, but looked upon it as one of those things which required further development before they could grant aid. In 1868 there was a small grant of £40, but the annual grants now amounted to some $30,000 a year, which showed what importance the Government now attached to salmon culture.

The salmon fisheries of the world required the utmost protection, and care must be taken to prevent fish being destroyed during the breeding seasons. Salmon culture ought to be carried out in every country where those fish were indigenous to the waters. In Canada fish culture had been carried on for a length of time, and its fruits were beyond cavil. There were, however, some people who found fault with everything, no matter what it might be, and he regretted very much that Mr. Whitcher, a colleague of his in the Canadian Fisheries should have thought proper to issue circulars amongst the Commissioners, stating that fish culture had not been satisfactory. Mr. Whitcher's own documents, *evidently not written nor read by himself*, however, proved the very reverse of that statement, and the blue-books of Canada contained returns which showed most conclusively the beneficial results arising from the protection of rivers and the raising of salmon by artificial means. After quoting a number of returns from Inspectors of Fisheries and other officers from the annual reports of 1882, proving that there had been a very remarkable improvement in the salmon fisheries of Canada, he said it would be quite unnecessary to read the individual reports of fishery officers in all parts of Canada, which, with only a few exceptions, indicated that the salmon were increasing wonderfully during 1882. He might also mention that he had received letters stating that the catch of salmon by netters and anglers in 1883 had been in excess of any previous period, especially in those rivers where salmon hatcheries were in operation. It was the duty of all civilized governments and intelligent people to adopt such means as would bring about a better supply of food, and he had no hesitation whatever in saying that the means adopted in Canada had in most instances been very beneficial. Perhaps on some future occasion the matter might come on again; if so he could give volumes of even stronger evidence in proof of the success attending fish culture.

It was painful indeed to be obliged at this Conference to refer to the circular issued by this well-known official grumbler in Canada, who, to gratify personal spleen, had wantonly attacked an industry of world-wide beneficial reputation; more especially as the Canadian Minister at the head of the Fisheries Department, and himself, were here on behalf of that country advocating the importance of fish-cultural operations in the Dominion, the practical display of which, at this great International Fisheries Exhibition, had gained for it-

self great popular favour, and also materially aided in the general exhibit, and placed Canada amongst the foremost of the nations for efficiency and completeness in the science of artificially propagating fish. From the gratifying way in which Professor Goode's remarks and his own had been received on this subject, it was clearly unnecessary to refer further to this "under the belt" stab in the circular, feeling assured that similar conduct is always frowned down by the manly English public.

Mr. Milne Home, in reply, said that if there had been nothing more than the opportunity which had been given to his friends from the United States and from Canada to give the explanations to which the meeting had been listening, the Conference had done good. He had been somewhat astonished when he read the circular referred to, because it was in contradiction to what he had read of the complete success of artifical fish culture, and he could not believe it possible that such statements were correct, but he felt it was not for him to bring the matter forward in a paper relating only to the fisheries of this country. They had had the pleasure of hearing from Mr. Wilmot and Professor Brown Goode that the statements were not to be credited, and he cordially agreed with the views which had been expressed as to the value of artificial hatching. They had in their own country a hatchery belonging to his friend Sir James Maitland, which he had visited twice, and knew to be a success. There was one in Dumfriesshire, and there were two or three others, on a smaller scale. He hoped they would soon have more of those private establishments, but he also could not help thinking and saying that there ought to be some encouragement given to them by Government. If they were to appoint an inspector to visit those establishments and report upon them, with a view to make known what they were doing, it would be a good thing. He had for some years past endeavoured to possess himself of the Reports of the Canadian and United States Commissioners, and had obtained from them very valuable information; and he thought we in this country ought to learn a lesson from Canada and the United States.

Mr. Milne Home then proposed a vote of thanks to the Chairman, which was carried unanimously.

The Chairman, in response, thought the pith of what had been said was, that they should all use their best endea-

vours to induce Government to assist in the propagation of fish and in the increase of the number of salmon in this country. Out of evil often came some little good, and he thought the circulation of the documents which had been referred to, instead of doing harm, had brought out more clearly the great success which had attended the artificial propagation of fish.

CONFERENCE ON WEDNESDAY, JULY 18, 1883.

His Excellency M. De Falbe took the chair, when the following paper was read by Mr. Howitz on

FOREST PROTECTION AND TREE CULTURE ON WATER FRONTAGES, WITH THE VIEW OF PROVIDING A CONSTANT AND STEADY SUPPLY OF WATER, FOOD, SHADE, AND SHELTER FOR FRESHWATER FISH.

Discussion by Prof. Brown Goode, Major Sewell-Gana (Chili), the Marquis of Hamilton, Mr. Wilmot (Canada), and his Excellency M. DeFalbe.

Mr. Wilmot seconded the resolution of thanks. There was no doubt that this paper was of a novel character as connected with fish culture, for he was quite aware that it had not been discussed before in any public manner, but he might be pardoned for mentioning that on two or three occasions on sending reports to the Government of Canada he had expressed his views that the clearing of the forests had been one of the principal causes of the destruction of salmon in the Province of Ontario. He could speak from experience in the matter, on account of salmon being very numerous in a stream that ran through his property. Before the forests were cleared off, salmon and the better kinds of fishes were there in vast numbers, but as the trees were cleared off the water changed its temperature, it became less in quantity, and the consequence was they had lost all those valuable fish. He should not attribute it wholly to the want of trees, but that had been one of the principal agencies. Man, with his destructive engines, had of course aided by killing the parent fish when laying its eggs in those streams, but there was no doubt that the want of sufficient shade and coldness

of the water for the fish to live and breed, was also an important element, because these higher breeds of fish were always found in cold waters. So important was it, that for the last two or three years he had set out a large number of trees round the ponds were he was carrying on fish culture, and found it very beneficial, and he had often noticed the fish run underneath the shade of the trees on hot days, the temperature being lower there than out in the open stream. He had always contended that farming, forestry, and fish culture should go together, because one aided the other. Forestry aided agriculture, because if the whole forest was cut away the rainfall was interfered with, and agriculture was more or less affected. There were localities in Canada where forests had been wholly destroyed, where now they were unable to raise the same kind of grain as in former years; therefore it was evident that the *total* clearing of forests was injurious to agriculture. He was very glad that this Paper had been read, because it would now be spread abroad and carry authority with it, and would, no doubt, do a vast deal of good. In his opinion, forests were useful in filtering the water which passed into the stream. The trees themselves filtered it, and so did the leaves on the ground, and the water was more pure than when it fell direct on the soil and ran straight into the river. There was no need to interfere with cultivated land, but rows of trees might be planted by the side of streams, which would not affect farming operations, and would conduce to the growth of fish. There was no doubt that the greater amount of forests on the face of the earth the greater the rainfall. Last year the Legislature of the Province of Ontario passed an Act incorporating a Forestry Association, the object of which was to set out trees for the benefit of the country, and to prevent the destruction of those around the fields and along the sides of the roads.

CONFERENCE ON JULY 27, 1883.

E. Birkbeck, Esq., M.P., in the Chair.

A NATIONAL FISHERIES SOCIETY.

By Charles E. Fryer.

Discussion by Dr. Francis Day, (India), Mr. O. T. Oslen, (Grimby), Mr. Oldham Chambers, (Lowestoft), Mr. Wilmot, (Canada), Prof. B. Goode, (United States), Mr. Mondehare, (Commissioner for France), Mr. Fryer, and the Chairman, Mr. E. Birkbeck, M.P.

Mr. Wilmot said the subject of a National Fishery Society was a very important one, and one which should have been taken up by this country many years ago. Had that been done there would not have been the present outcry about the want of fish, for it would have brought such force to bear on the Legislature as to cause it to undertake the protection of fish more liberally than it had done. The remarks which had fallen from Mr. Fryer in many points were exceedingly good, but coming as he did from a far off country, where the protection and production of fish was advocated very largely, he regretted that the paper had not touched on that subject. He did not recollect a syllable was mentioned with regard to protection or production of fish, but that was one of the most prominent features in connection with the requirements of the fisheries. In Canada there was a Minister of Marine and Fisheries whose duty it was to look after this important work. Previous to the Confederation of the Provinces each Province had some sort of law for the protection of the fisheries, but they were so abortive as to prove useless. At the time of the Confederation, however, when the seven Provinces were brought together, it was deemed so important that the fisheries should receive protection that a Cabinet was formed for the purpose which had been of vast service in bringing about many things which otherwise would not have been accomplished. Statistics were obtained from the fishermen, the fishery officers, and various other resources, which were

collected and submitted to Parliament annually, and Parliament legislated on any improvement which might be required for the purpose of advancing the general interests of the fisheries or the fishermen. It seemed to him extraordinary that in a vast and intelligent country like Great Britain the Government had not taken up this great question of protecting, improving and advancing the interests of the fisheries, a step which had been taken by Canada, the United States, and many other countries. It seemed to him a mistake to leave such an important matter to individuals. No doubt great benefits would result from this Exhibition and the papers and discussions connected with it, and he hoped the question would be brought before Parliament, for he had heard the Chairman himself say it was the duty of Parliament to take it up. Notwithstanding everything that had been said, he contended that the fisheries were decreasing. Even though a million barrels of herrings might be collected to-day, and at the beginning of the century only a quarter that number were taken, it would not follow that there were any more fish. It was the reverse; because the fishermen had to go further to get them and to employ ten times the amount of wealth and ability, and a hundred times the appliances which were formerly applied. He contended that until some means were instituted by which fish could come nearer to the coast to carry out the laws of nature in reproducing their species they would be gradually exterminated. He knew of no kinds of fish which did not come nearer the coast when laying eggs than at any other times. They were out in the far depths of the ocean feeding, but when spawning time came they approached the shore and protected places; and if man, by his greed, was determined to kill these poor creatures, the authority of Parliament ought to step in and prevent it. If such a course were not pursued, before half a century the larger proportion of fish which now frequented the coast would be destroyed, and none would be found at all. In Canada there were large expanses of water, 200 to 300 miles in length, in which the fish had been nearly exterminated. He thought the idea of a National Society was a good one, but they should go farther and apply to the Government of the country to establish some department which should encourage the fishing industry by protection and propagation.

Mr. Wilmot seconded the motion of thanks to the Chairman with much pleasure, because he understood that Mr. Birk-

beck stood foremost in this country with respect to the interests he took in the great fishing industries. He was the inaugurator of the first fishery exhibition, and was Chairman of the Executive of this one which is the International adjunct to that held at Norwich. He had been a member of Parliament for some time and no doubt would remain so for a long time yet to come, and he hoped that before long he would hold an official position at the head of a Government Department which would preside over the interests of British Fisheries, for there was certainly no one more competent to occupy so important a post.

CONFERENCE ON TUESDAY, JULY 31, 1883.

Lord Abinger in the Chair.

FRESHWATER FISHING IN GREAT BRITIAN OTHER THAN TROUT OR SALMON.

By I. P. Wheeldon, late Editor "Bells Life."

Discussion by Mr. Wilmot, (Canada), Mr. Wheeldon, Admiral Bernabe, and the Chairman, Lord Abinger.

Mr. Wilmot said he must say a word with regard to the somewhat notorious black bass of Canada as his name had been mentioned. Mr. Wheeldon had rather misunderstood his feeling towards the black bass, which was not a favourite of his by any means; and on two or three occasions he had expressed the opinion that it was unadvisable to introduce it into Great Britain, unless it was into waters where there were no other fish of a superior kind. The black bass was a fish of good feeding quality; not a bad fish to eat; but not a favourite of his. He fished more for trout and salmon, and a man who was in the habit of doing so, would not fish for bass or any inferior fish. Black bass were a very voracious, greedy fish, and invariably cleaned out any other fish in the same waters, unless it was perch, which sometimes would hold their own, being of a somewhat similar character. Fishing in Canada was quite different from what it was in Great Britain. There they did not have barbel, dace, and

roach, nor any fish of that kind. There might be some descriptions of fish of that class; but at present the sluggish streams had chub, pike shiners, and coarse fish of that sort. These fish were evidently of a low order, because they fed at the bottom of the rivers as a rule, and were therefore not to be compared with those of a higher order, such as trout, which rose to the surface for their food; in fact you did not find trout in streams which were not limpid and clear, because they must see their food at the top of the water. He could readily understand why in a country like England, and in a city like London, so many people were fond of fishing. It was very fortunate that the Thames gave the people residing in London so many opportunities of fishing, even although the fish might be of an inferior order. It was a pleasant, healthy pastime, and if they got only one or two fish to eat for their day's labor, it was very pleasant when they came home to sit down and tell the tale of the day's sport. He thought, therefore, that angling in every possible way should be encouraged, because it could never seriously diminish or destroy the fish in any stream as netting would. If more encouragement were given to anglers, it would be beneficial to fisheries as a rule. In Canada no one was allowed to fish for salmon with bait; the law was very distinct, that it should only be fly surface fishing. The belief there was that salmon did not take food in the rivers at all;* and

* Note by Mr. Wilmot—Salmon do not take food on their migration up rivers to their spawning grounds. This view is now almost universally held by all persons practically acquainted with the nature and habits of the Salmon. There are, however, some disbelievers of this statement. The following facts are given to sustain Mr. Wilmot's position, viz:

(1) The stomach of the Salmon is found *distended* with food in a half-digested state, when captured beyond the estuaries of rivers and in the sea.

(2) Food is *never* found in the stomach of the Salmon above tide water or in the fluvial parts of rivers.

(3) Salmon begin to deteriorate, in flesh and in color, as soon as they enter the fresh water, and continue this falling off until they reach salt water and commence feeding again.

(4) After being in the rivers for a time, from the fat, silvery-coated Salmon, they change to a lean, lank, emaciated, dirty, black-looking fish; in many instances after spawning they become so poor and prostrate that great numbers die.

(5) The fatty substance of the body put on in their feeding grounds in the sea, is consumed by internal absorption, to partially sustain the fish on his migration up rivers, and to nourish the growth of the ovaries and milt for maturity, previous to being laid in the spawning beds. The fatty substances of the body thus passing into the ovaries, presents to the eye the small, oily globules seen in the eggs when laid, and forms the food of the embryo fish before, and for a short time after, hatching out.

(6) The writer has seen many Salmon opened, and has opened many

the Government was so particular with regard to the protection of salmon when they passed all the nets and other engines which might be set at the estuaries, the fish having got past those, were only to be caught by the fly. He would suggest that if a law—something of that sort—were passed in England, it would be beneficial, and encourage a higher order of angling than catching salmon with bait. He beg-

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hundred himself when caught in fresh water, but in no instance was there ever one particle of food found in their stomachs. He has also kept confined in ponds numbers of Salmon before and after spawning for periods of two, eight, and twelve months, where natural food was plentiful, yet they never took it, but could, nevertheless, be caught with an artificial fly.

(7) In all cases when opened the gullet, or entrance to the stomach, seemed, as it were, from its closely contracted appearance, to forbid the possibility of food of any kind passing through it.

(8) The great numbers of Salmon that enter many of our rivers would, if they took food to sustain their large bodies, consume at one single meal every living creature in the river that would be adapted for them to eat—yet in many instances, and in many rivers, Salmon are from one to five and six months in the fresh water, on their journeys to their spawning grounds.

(9) In the Fraser and other rivers on the Pacific slope Salmon are so abundant in them as to actually crowd themselves upon the banks. *Query*—Where and how could it be possible for these vast shoals of Salmon to procure sufficient food to sustain them in the narrow confines of the river? On the contrary they become lean, exhausted, and after spawning die in thousands from sheer emaciation.

(10) It is well known by anglers that when salmon are taken with the fly the hook is seldom found deep in the mouth, and *never* in the gullet, but almost invariably the fish is hooked on the inner or outer sides of the jaw, and now and then in the tongue. If taken voraciously for food why not find the hook in the gullet, as in trout and other fish that actually take it for food by swallowing the bait.

(11) It may be asked, then, why do Salmon rise to the fly at all if not for food? It is the exception, not the rule, to take Salmon with the fly; they take it sometimes in anger when crossing their vision; and, sometimes from a sportive mood, in seeing a luring, dangling object above them. Dozens, yes hundreds of Salmon are often seen in pools by the angler, who may cast over them for days without taking a fish, and then, perchance, some morning or evening he may hook one, two, and sometimes more. Now, if these took the fly for food, why not capture many more of the hundreds that certainly ought to be in the same eating mood as their fellows who were taken?

(12) The sequel is here—by a wise ordination of Providence Salmon are not permitted, by an instinctive feeling in their nature, to feed upon their own off-spring, and in the very same nurseries, too, in which they had at a former period laid their eggs to re-produce their species. Did the Salmon feed in the rivers and other streams which are their *breeding grounds*, in like manner as in the sea, which is their *feeding ground*, the beautiful aim of nature to safely maintain their species would be thwarted. For the countless thousands of these large, (at other times) voracious fish on their journey up to their nurseries to reproduce their kind, would meet their broods of young of the former years coming down as "parrs," as "smolts," to the sea and devour them, thus actually destroying the very object for which the Great Creator had originally so wisely ordained all things.

ged to propose a vote of thanks to Mr. Wheeldon for the instructive lecture he had given.

Doctor Honeyman, in seconding the motion, said he did not know much about angling himself; but he so much admired the enthusiasm of Mr. Wheeldon on the subject that he was very much inclined to wish he was an angler himself.

CONFERENCE ON 24th OCTOBER, 1883.

Mr. Fung Yee, Secretary of the Chinese Legation in the Chair.

ON NEWFOUNDLAND; ITS FISHERIES AND RESOURCES IN CONNECTION THEREWITH.

By Sir Ambrose Shea, K.C.M.G.

Discussion by Mr. Sayer, Mr. Wilmot, Captain Curtis, R.N., Sir Ambrose Shea, (Newfoundland); Mr. Herbert Hounsell, Mr. Mackie and the Chairman, Mr. Fung Yee (China.)

Mr. Sayer proposed a vote of thanks to Sir Ambrose Shea for his very valuable Paper. He said there was not much dried cod used in this country, because we were supplied so well with fresh cod. We used to get fish off Ramsgate and Margate, *but now we had to go nearly to the coast of Norway for it, and there was no doubt the time would come when English fishermen would have to make their way to Newfoundland, and perhaps even to America.* There was no town in the world so well supplied with fish as London, as was shown by the fact that Mr. Hewitt supplied Billingsgate with 13,000 tons of fresh fish, at a coast of 1½*d.* per lb. He had no doubt there was an opening in Newfoundland for English merchants, and he hoped the time would come when the Labrador herring would be brought to the London market. The nets formerly employed had a mesh of *twenty-eight* to the yard, but they were used now *forty to the yard*, the result of which was that immature fish were caught, and fishermen had to go farther and farther off.

Mr. Wilmot, in seconding the motion, said it afforded him great pleasure to find that the adjoining colony to his own took such a prominent part in the Exhibition, and he hoped the time would arrive when his friend Sir Ambrose Shea would come to the conclusion that it was advisable not to stay out in the cold, but to join the Canadian Confederation. Had the two colonies been united, they would have stood foremost in the world for the exhibit of fish. No one was better fitted to prepare a Paper on this subject than Sir Ambrose Shea, who had been identified with Newfoundland for a long time, and who recently had a title conferred upon him by Her Majesty, which was esteemed an honour by all the colonies. Mr. Sayer had referred to the possibility of England having to go to Newfoundland or Canada or America, for some portion of her fish supply. It had been his object throughout to press the importance of protecting the fisheries of this country, and he was glad to find that Mr. Sayer held the view that England had, in an improper and wanton manner, destroyed the fish round the coast. This had been brought about by the avarice of the fishermen not being checked by the Government. He would not dilate further upon this topic, but he could not express too strongly his sense of the want of some protection being afforded to the fish.

Mr. Wilmot then proposed a vote of thanks to the Chairman, which was carried unanimously.

CONFERENCE ON WEDNESDAY, OCT. 24, 1883.

Sir Ambrose Shea, K.C.M.G., took the Chair.

FISHERIES OF CHINA.

By J. Duncan Campbell, Commissioner for China.

Discussion by Mr. Wilmot (Canada) Mr. Chas. Fryer, Mr. Sayer, Cap. Curtis, R.N., Mr. Herbert Hounsell, Mr. Newman (China) Surgeon-General Gordon, C.B., Mr. Campbell, Mr. Fung Yee (China) and the Chairman, Sir Ambrose Shea.

Mr. Wilmot said that as his name had been mentioned in the Paper he might say briefly he had no doubt the salm-

on could be introduced to any part of the world where the water was of such temperature and clearness as to suit their habits of life. When they found that through the operation of pisciculture salmon had been introduced from Great Britain to waters below the Equator, where they were not indigenous, he saw no reason why it should not be equally possible to introduce them elsewhere, particularly in a country like China, some of the rivers of which he was strongly inclined to believe were frequented by salmon, but even if that were not the case he was quite sure that many of her more northerly rivers were adapted to this fish. It was a mere question of temperature and limpidity. The Sacramento river in California, where the atmosphere sometimes rose to 120° in the summer, was at one time overflowing with salmon, though it had been to some extent reduced by over-fishing now.

Mr. Fryer understood that the Chinese in California surprised the Americans by the wonderfully small fish which they caught and ate, and if the same habit prevailed with the three hundred millions of Chinese in their own country, and they were continually catching these small fish in season and out of season, it afforded a strong argument against the possibility of depleting the waters.

Mr. Wilmot said he could not allow Mr. Fryer's remarks to pass without a word or two. Being a strong advocate of the artificial propagation of fish, and of their protection generally, he felt bound to point out that the temperature and climate of China was very warm, and consequently the fish there produced their young in very warm water. They knew that under such circumstances fish were hatched in as many days as it took months in colder climates, and thus the propagation and natural increase of fish there would be a thousandfold greater than in England or in Canada. The salmon family took from three to six months for the eggs to incubate, whilst some other descriptions that laid their ova in warm climates would hatch out in from sixty hours to six days. There was therefore no foundation for the idea put forth by Mr. Fryer that because protective laws might not be in operation in China they were equally unnecessary elsewhere.

CONFERENCE ON THURSDAY, OCT. 25, 1883.

Mr. S. WILMOT (Commissioner for Canada) in the Chair.

FISH PRESERVATION AND REFRIGERATION.

By MR. J. K. KILBOURN.

DISCUSSION by Mr. Kenneth Cornish, Mr. Alward (Grimbsy) Mr. F. N. MacKay, Mr. Hesbeth, Dr. Rae, Sir Ambrose Shea, Major Sewell-Gana (Chillian Commissioner) Mr. Alward, Mr. Kilbourne, Mr. Mackie, Chevalier Bik ker-Caarten, and the Chairman, Mr. Wilmot (Canada.)

The CHAIRMAN, (Mr. Wilmot), in putting the resolution of thanks to Mr. Kilbourn, said he held in his hand a slip from a newspaper to the effect that some thirty-five tons of fish were thrown away in the London market the other day as being unfit for food, yet at the same time thousands of poor people were on the point of starvation for want of food. Surely some means ought to be provided whereby such a state of affairs could be prevented. He believed this was largely brought about by avarice and greed upon the part of the fishermen in catching more fish than was necessary to supply the market, and the fish dealers allowing over-stocks of fish to spoil rather than sell them at reduced prices to the poor; too many were taken, they were brought to shore and, without proper supervision, were sent off, and in many cases became unfit for food before they reached their destination. In Canada, fish were caught in the great Western Lakes in great quantities. They were put on board of little steam tugs in refrigerating boxes, and conveyed, perhaps, 100 or 200 miles to nearest harbour or railway station. The boxes were then put on the railway car and went on in some instances, 1,000 or 2,000 miles, and were sold as fresh fish, and were eaten as readily as those caught within a few miles of the market. He had been struck with astonishment that within the area of this small island, as it was compared with Canada, similar means were not introduced, instead of having so many fish spoilt. Not only were the fish taken

to market in these refrigerators, but they remained in the cellars of the dealer for a week or ten days after they arrived there. The process was very simple ; the fish were taken out of the water in tons weight ; on deck were a number of boxes, of which a specimen could be seen in the Canadian Court, forwarded by Mr. Leckie, of Toronto, each box holding about one ton. It was packed round the outside with non-conducting material ; a layer of finely powdered ice was put in the bottom, then a layer of fish, then another layer of ice, and so on until there were fifteen or twenty layers of fish and ice, and it was then shut down tight and sent off. He need hardly say that if the fish were not in good condition, the inhabitants of the great cities of the United States would not eat them. He had often eaten this fish in the best hotels in Toronto, and it was difficut to distinguish them from fish caught in the bay in the front of the city. If some similar mode were adopted here they would not hear of fish coming to the London market and being condemned the next day as unfit for human food. It was said by some persons that frozen fish were not fit for food, but he could contradict that *in toto*. The fish he had previously been speaking of were principally white fish, pickerel, pike, sturgeon, and fish of that order ; but he would now say a word or two with regard to salmon. This was caught in large numbers in the Canadian rivers. This year there had been so plentiful a supply that they had been unsaleable at a remunerative price, and large quantities were immediately frozen. Since he had been over here he had written to dealers in Canada to have some of this frozen salmon sent to England, but the reply he got was that they could not do so, as they were under contract for all their fish to be delivered next January, February and March in New York, Boston and Philadelphia. Now, if in Canada they caught fish in June, July and August, and froze them up, and the fish dealers in New York and Boston would buy them for delivery next year, it was evident the fish could not be very much detoriated by freezing. He had eaten those fish for several years past, and it was the usual custom to have it on Christmas Day, when, the waters being frozen, of course it was impossible to catch fresh fish, but they were considered as good then as when caught in June. There might possibly be a very slight difference in the quality, but that was not the question. Fish could be preserved in this way so as to form food for the greater portion of the people, and

if those who cultivated more fastidious palates were not satisfied with it they need not eat it. It seemed to him a burning shame that so much fish should be thrown away as unfit for food when there were evident means of preserving it. In the Canadian Court there were specimens of fish caught in June, 1882, which had been kept in the frozen state up to the present time. A fortnight ago one of those cases was opened and some fish taken out, and they were so hard they had to be sawn in slices. He took a piece home and had it cooked, and it certainly was very good, but perhaps to the epicure not so delicate as a fresh piece he might have bought in the market; but it was a delicious food, fit for any one to eat, and he certainly thought the more frozen fish they could get the better. The vote of thanks was then carried.

Mr. MACKIE proposed a vote of thanks to the Chairman who had been so regular in his attendance at these Conferences, and had conveyed so much useful information to those who attended.

The motion was seconded by the Chevalier Bicker-Caarten, and carried unanimously.

The CHAIRMAN, Mr. Wilmot, in reply, said it was very gratifying to him to find that his remaaks had been received with approbation. One of the main points which he had endeavoured to impress upon those who attended those Conferences was, that if the present destruction of fish went unchecked, the time would come when the supply would be entirely exhausted.

NOTE—Since the above discussion took place Mr. Wilmot has taken some of the salmon frozen in June, 1882, out of the Canadian Freezers on exhibition, and presented them to persons of high distinction in London. In dining with one of these, the salmon when served up was not distinguishable by the host or his guests from fresh caught fish.

FISHERY INDUSTRIES OF THE UNITED STATES.

By G. Brown Goode, M. A.

His Excellency the American Minister (James Russell Lowell, Esq., LL.D.) in the Chair.

EXTRACTS.

"Especially prominent in this work has been the 'American Fish Cultural Association,' organized in 1871,* which has always led public opinion in matters connected with fishery protection and propagation, and has published a valuable series of Transactions."

"In 1871 the United States Fish Commission was established. Arrangements were at once made for a thoroughly scientific investigation of the fisheries, and a little later the work of *artificial propagation* was begun. The operations of this Commission have increased from year to year, and much has been done in extending the range of important food-fish, and in re-stocking depleted waters. The shad has been introduced into the waters of the Mississippi Valley and the Pacific Slope; the California salmon and rainbow-trout have been placed in the Atlantic tributaries; and German carp have been distributed over the greater part of the country."

"Up to 1878 the work of the Commission was confined wholly to fresh-water and anadromous species. In this year, however, a station was established at Gloucester, Mass., for the propagation of marine species; and cod, herring, and haddock were successfully hatched. In 1880 successful experiments were made with severel food-fishes from our southern seaboard."

"Beside the improvement of apparatus, radical changes have been made in the methods of fish culture. The most important of these is the building of moveable floating hatcheries, in the form of barges and steamers, by the

* At first called the Amerigan Fish Culturists Association, but changed in 1878 to the American Fish Cultural Association, to admit to membership those not actually engaged in fish culture.

United States Fish Commission. By means of these, different spawning grounds may be visited during the same season, and the result of the work enormously increased, with a comparatively small increase in its cost. The application of steam for pumping the water and for working the apparatus is also of great value. Equally important with these is the improvement in the methods of transportation. Formerly the fish were carried in small quantities in the baggage-cars of ordinary passenger-trains, but refrigerator cars, built expressly for the purpose, are now almost exclusively employed. Trained experts are placed in charge of these cars, and immense numbers of fish are now distributed with small loss and at a great reduction in cost as compared with the old method."

TABLE OF PUBLIC APPROPRIATIONS FOR THE UNITED STATES FISH COMMISSION AND FOR TWENTY-EIGHT STATE COMMISSIONS.

UNITED STATES, 1871-9		476,200
EASTERN STATES (6).		
Maine, 1867-80	36,975	
New Hampshire, 1866-79 . .	22,663	
Vermont, 1871-9	7,800?	
Massachusetts, 1866-79 . . .	80,500	
Rhode Island, 1870-79 . . .	10,500	
Connecticut, 1868-80 . . .	43,300	
		201,738
MIDDLE STATES (3).		
New York, 1868-79	165,000	
New Jersey, 1872-80 . . .	29,500	
Pennsylvania, 1873-80 . . .	99,630	
		294,130
SOUTHERN STATES (6).		
Maryland, 1874-80	76,500	
Virginia, 1875-79	15,000	
West Virginia, 1877-79 . . .	3,900	
South Carolina, 1870 . . .	800	
Georgia, 1876-79	2,000	
Kentucky, 1876-80	11,000	
		109,200
WESTERN STATES (13).		
Ohio, 1873-80	29,000	
Illinois, 1880-81	3,000	
Michigan, 1873-80	53,000	

Wisconsin, 1873-80	38,860	
Minnesota, 1874-80	22,500	
Iowa, 1874-81	22,750	
Missouri, 1877-80	7,000	
Kansas, 1877-80	2,000	
Nebraska, 1879-80	1,000	
Colorado, 1877-80	2,400	
Nevada, 1877-80	5,000	
California, 1870-80	37,000	
Wyoming, 1880	1,600	
		225,110
		1,307,378

The Oyster Industry.—The oyster fishery is the largest upon the list. It employs 52,805 persons, and yielded, in 1880, 22,195,370 bushels, worth to the producer $9,034,861. There is to be considered an enhancement on 13,047,922 bushels, in passing from producers to market. This enhancement, which amounts to $4,368,991, results either from replanting or from packing in tin cans, and increases the value of the products to $13,438,852. This fishery employs 4155 vessels valued at $3,528,700, and 11,930 boats. The actual fishermen number 38,249, the shoresmen 14,566. About 80 per cent. of the total yield is obtained from the waters of Chesapeake Bay. A speedy extermination of the most valuable mollusk will doubtless result unless some effective means of protection and *artificial culture* are soon employed.

2. *The Pacific Salmon Industry.*—The Salmon fishery of the Pacific is another industry peculiar in its methods and extent. The Quinnat, or King Salmon (*Salmo quinnat*, = *Oncorhyncnus chouicha*), also often called the California Salmon, is the principal object of capture, though other related species are also taken. Though the capture is enormous, it has been demonstrated that the supply can easily be kept up by a small outlay in *artificial culture.*

On the 9th of February, 1871, Congress passed a joint resolution which authorized the appointment of a Commissioner of Fish and Fisheries. The duties of the Commissioner were thus defined: "To prosecute investigations on the subject (of the diminution of valuable fishes) with the view of ascertaining whether any and what diminution in the number of the food-fishes of the coast and the lakes of the United States has taken place; and, if so, to what causes

the same is due; and also whether any and what protection, prohibitory or precautionary measures should be adopted in the premises, and to report upon the same to Congress."

The principal activity of the Commissioner, however, has been directed to the wholesale replenishment of our depleted waters. The success of *fish culture* is well recognized in the United States, but it was especially gratifying to its advocates that in 1880 the Grand Prize of the International Fisheries Exhibition at Berlin was awarded to Professor Baird as "the first fish-culturist in the world."

The origin of the Commission, its purposes, and methods of organization, having been described; it now remains to review the accomplished results of its work. In many deparments, especially that of direct research, most efficient services have been rendered by volunteers; in fact, a large share of what has been accomplished in biological and physical exploration is the result of unpaid labor on the part of some of the most skilful American specialists.

A suitable place having been selected, a temporary laboratary is fitted up with the necessary appliances for collection and study. In this are placed from ten to twenty tables, each occupied by an investigator, either an officer of the Commission or a volunteer.

The permanent head-quarters are located at Wood's Holl, Massachusetts, where wharves are being built for the accommodation of the fleet of the Commission, and a house for use as scientific and fish-cultural laboratories, and where the propagation of sea-fishes will be continued on a larger scale than heretofore.

For several years steamers were lent for the work by the Secretary of the Navy and the Coast survey and Revenue Services.

In 1880, however, a steamer of 450 tons, the *Fish Hawk*, was built for the Commission. This being needed for *fish-hatching purposes*, another larger steamer, of 1000 tons, the *Albatross*, has just been put into commission. She has already, since April, made two successful deep-sea explorations, and has been supplied with every means for work of this kind.

In connection with the work of fish culture much attention has been paid to embryology. The breeding times and habits of nearly all of our fishes have been studied, and their relations to water temperatures. The embryological history of a number of species, such as the cod, shad, ale-

wife, salmon, smelt, Spanish mackerel, striped bass, white perch, the silver gars, the clam and and the oyster, have been obtained under the auspices of the Commission.

The preservation of the oyster-beds is a matter of vital importance to the United States, for oyster-fishing, unsupported by oyster-culture, will, within a short period, destroy the employment of tens of thousands and the cheap and favorite food of tens of millions of our people.

Something may be effected by laws which allow each bed to rest for a period of years after each season of fishing upon it. It is the general belief, however, that shell-fish beds must be cultivated as carefully as garden-beds, and that this can only be done by leasing them to individuals. This is already the practice in the Northern States, where oysters are planted in new localities; there is difficulty however, in carrying out this policy in the case of natural beds, to which the fishermen have had continued access for centuries. It is probable that the present unregulated methods will prevail until the dredging of the natural beds come to be transferred from the improvident fishermen to the care-taking oyster-culturists, with a corresponding increase in price and decrease in consumption.

Fishes in ponds, lakes or streams are quickly exterminated unless the young fish are protected, the spawning season is undisturbed, and wholesale methods of capture are prohibited.

A river may quickly be emptied of its anadromous fishes, salmon, shad, and alewives, by over-fishing in the spawning-season, as well as by dams which cut off the fish from their spawning-grounds. Examples of this may be found in dozens of American rivers.

In the same way, sea-fishes approaching the coasts to spawn upon the shoals or in the bays may be embarrassed, and the numbers of each school decimated, particularly if, as in the case of the herring, the eggs are adhesive and heavy.

Sea-fishes spawning in the estuaries are affected by wholesale capture with stake nets, much in the same manner, though in a less degree, than salmon in the rivers.

Almost any piece of water, be it a bay or sound, or be it the covering of a ledge or shoal at sea, may be over-fished to such a degree that fishing becomes unprofitable, especially if fishing be carried on in the spawning season.

The policy of the United States Commissioner has been

to carry out the idea that it is better to expend a small amount of public money in making fish so abundant that they can be caught without restriction and serve as cheap food for the people at large, rather than to expend a much larger amount in preventing the people from catching the few that still remain after generations of improvidence.

The proper function of *public fish culture* is the stocking of the public waters with fish in which no individual can claim the right of property. This is being done in our rivers, with salmon, shad, and alewives, and in our lakes with whitefish.

Public fish culture is only useful when conducted upon a *gigantic scale*—its statistical tables must be footed up in tens of millions. To count young fish by the thousand is the task of the private propagator.

The use of steamships and steam machinery; the construction of refrigerating transportation cars, two of which, with a corps of trained experts, are constantly employed by the Commissioners, moving fish and eggs from Maine to Texas, and from Maryland to California, and the maintenance of permenant hatching stations, 17 in number, in different parts of the continent, are forms of activity only attainable by government aid.

Equally unattainable by private effort would be the enormous experiments in transplanting and acclimatizing fish in new waters; California salmon in the rivers of the east; land-locked salmon and smelt in the lakes of the interior; such as the planting of shad in California and the Mississippi Valley; and German carp in ten thousand separate bodies of water in almost every state in the Union; the two last-named experiments, carried out within a period of three years, is a success beyond doubt, and of the greatest importance to the country; the others have been more or less successful, though their results are not yet fully realized.

It has been demonstrated, however, beyond possibility of challenge, that our great river fisheries, producing in 1880, 48,000,000 pounds of alewives, 18,000,000 pounds of shad, 52,000,000 pounds of salmon, besides bass, sturgeon, and smelt, and worth "at first hand," between 4,000,000 and 6,000,000 of dollars, *are entirely under the control of the fish culturist to sustain or to destroy*, and capable of immense extension.

The same is true of the *Coregonus* fisheries of the

Great Lakes, and there is every reason to believe, from experiments in part completed, that the dominion of *fish culture* may be extended in like manner for certain of the great sea productions, such as the cod, haddock, herring, mackeral, and Spanish mackeral fisheries.

The immense influence upon the sea fisheries of the maintenance of the abundance of anadramous fish in the rivers has already been indicated.

The following is a list of the hatching-stations operated by the United States Fish Commission in 1883 :

1. Grand Lake Stream, Maine, station for collecting eggs of the Schoodic salmon (*Salmo salar* var. *sebago*).
2. Bucksport, Me., station for collecting and hatching eggs of the Atlantic salmon (*Salmo salar*), and for hatching eggs of whitefish.
3. Wood's Holl, Mass. Permanent coast-station, which serves as a base of operations for the scientific investigations of the Commission, and as a hatching station for eggs of the cod and other sea-fishes.
4. Cold Spring Harbor, Long Island, New York. Station for hatching eggs of various species of salmonidæ for distribution in New York and vicinity.
5. Havre de Grace, Maryland. For the purpose of collecting and hatching eggs of the shad (*Clupea sapidissima*).
6. Washington, District of Columbia.
   a. National Carp ponds.
   b. Arsenal ponds. Ponds for the propagation of carp.
   c. Navy Yard. Station for collecting and hatching eggs of the shad.
   d. Central hatching station. A station fully equipped for scientific experiments connected with the propagation of fishes.
7. Wytheville, Virginia. A station for hatching eggs of brook-trout and California trout.
8. Saint Jerome's Creek, Point Lookout, Maryland. A station for the artificial propagation of the oyster, the Spanish mackerel and the bandy porgy.
9. Avoca, North Carolina. For collecting, hatching and distributing eggs of the shad, alewife and striped bass.

10. Northville, Michigan. A hatching station for the development and distribution of eggs of the white-fish.

11. Alpena, Michigan. A station for the collection and development of the eggs of the white-fish.

12. Baird, California.

a. Salmon station. A station on the McLoud River for the development and distribution of eggs of the California Salmon.

b. Trout ponds. A station near Baird, for collecting, developing, and distributing eggs of the California trout.

13. Clackamas River, Oregon. A station on Columbia River for collecting and hatching eggs of the California salmon.

"The hatchery at Northville, Michigan, is provided with natural and artificial ponds in which brook-trout, rainbow-trout, land-locked salmon and lake-trout, are kept for breeding purposes. In addition to the eggs obtained from these ponds, many millions of eggs of the white-fish, lake-trout, and wall-eyed pike are obtained in the waters of Lake Erie, and forwarded to Northville to be hatched and distributed. A large refrigerator is being put in in readiness for next season's work, when it is expected that fully 500,000,000 eggs of the white-fish alone will be hatched.

There are hatcheries at Bucksport and Grand Lake Stream. The former of these is provided with ponds in which salmon, purchased from the fishermen of the Penobscot River, in May, are confined till November, at which time the eggs are taken and the fish liberated. At Grand Lake Stream, the land-locked salmon is hatched. There were secured at these two stations, during the past season, 3,675,000 eggs of these species for distribution to different parts of the United States.

"The hatchery on the McLoud River in California was established in 1872. Large quantities of eggs of the California salmon are collected there annually. The eggs have been taken from the wild salmon, which have been prevented from ascending to their natural spawning grounds by a dam which he has caused to be thrown across the river just above the hatchery. Eggs of the rainbow-trout also have been secured in considerable numbers. In the eleven years since the salmon-breeding station has been in opera-

tion, 67,000,000 eggs have been taken, most of which have been distributed in the various States of the Union. Several million, however, have been sent to foreign countries, including Germany, France, Great Britain, Denmark, Russia, Belgium, Holland, Canada, New Zealand, Australia, and the Sandwich Islands."

"About 15,000,000 have been hatched at the station, and the young fish placed in the McLoud and other tributaries of the Sacramento River. So great have been the benefits of this re-stocking of the Sacramento that the statistics of the annual salmon catch of the river has *increased* 5,000,000 *pounds during the last few years.*

"The shad stations at Washington, D. C., and Havre de Grace, Maryland, have been recently enlarged, and are capable of holding immense numbers of eggs. At one of the Washington stations alone nearly 50,000,000 of eggs were received. An estimate of those for the other stations gives a total of over 70,000,000 eggs of this species.

"In 1877 the German carp was introduced into America by the United States Fish Commission. These were placed in ponds, especially prepared for them, at Washington and Baltimore. In 1880 the distribution of fry began, and up to January 1st of this year, the carp have been planted in no less than 17,860 localities. They prove to be especially adapted to our waters, and in some localities they grow with surprising rapidity. A fish, four inches long, placed in the waters of Texas, was found to have increased to 20½ inches in eleven months, at which time it weighed four pounds eleven ounces."

The propagation work has increased from year to year, as may be seen by the constant increase in the amount of the annual appropriation. A review of the results of the labors of the Commission, in increasing the food supply of the country, may be found in the annual reports; the rude appliances of fish culture in use ten years ago have given way to scientifically devised apparatus, by which millions of eggs are hatched where thousands were, and the demonstration of the possibility of stocking rivers and lakes to any desired extent has been greatly strengthened. This work is now carried on with machinery for propagation on a gigantic scale by the aid of steam.

The work of the Commission in fish culture has been that of stimulation and co-operation. The efforts of individuals have been encouraged in every way; indeed, there

is hardly a fish culturist in the United States who is not or has not been attached to its staff. What was done in improving the methods of artificial propagation has already been summarized, and need not be repeated here.

The same policy of co-operation has been extended to the State fish Commissioners and to fish culturists in every part of the world.

Discussion by Mr. Earll, U. S. Commissioner, The Marquis of Exeter, Professor Huxley, Marquis of Hamilton, and the Chairman, James Russel Lovell, Esquire, LL.D. the American Minister.

Mr. Earll said he had enjoyed most thoroughly listening to Professor Goode's Paper, but national modesty would prevent his saying anything with regard to it, and he would proceed to give a few details of the working of the Commission during recent years. They had heard from this Paper, as well as from Professor Huxley, of the enormous quantity of fish consumed as food by other fishes in the sea and rivers, and it therefore became necessary, in order that fish culture should become practicable, and in any way increase the supply of fish in a country, that there should not only be thousands but *millions* of fish hatched annually. The attention of the Commission had therefore been turned recently towards improving the apparatus, to secure greater enconomy of space and concentration of work, and also towards devising more effective methods of distribution. Each specialist had taken up a special line of work, and had carried on his investigations until he had either introduced some new form of apparatus which had enabled him to accomplish better results, or had invented some form of apparatus for transporting fry to a greater distance. Attention has also been turned to securing a greater number of eggs than was formerly obtained. At first the practice of the Commission was simply to attend the nets of the fishermen, and take such eggs as might be found in spawning females, but later it was found expedient to collect the fish and pen them until they should be ripened, when the eggs could be secured.

The Marquis of Exeter said he had been asked to

move a vote of thanks to Professor Goode, and he felt that very few words of his were requisite in so doing, for he was sure the whole meeting would concur in giving him a most hearty vote of thanks for the very able, instructive, and exhaustive Paper which he had read. It entered so completely into the details of the great breeding establishments of the United States, that all who took an interest in pisciculture would derive great benefit from it, and it would enable them to improve their own establishments; he was quite sure that many of the hints he heard would enable him to do so.